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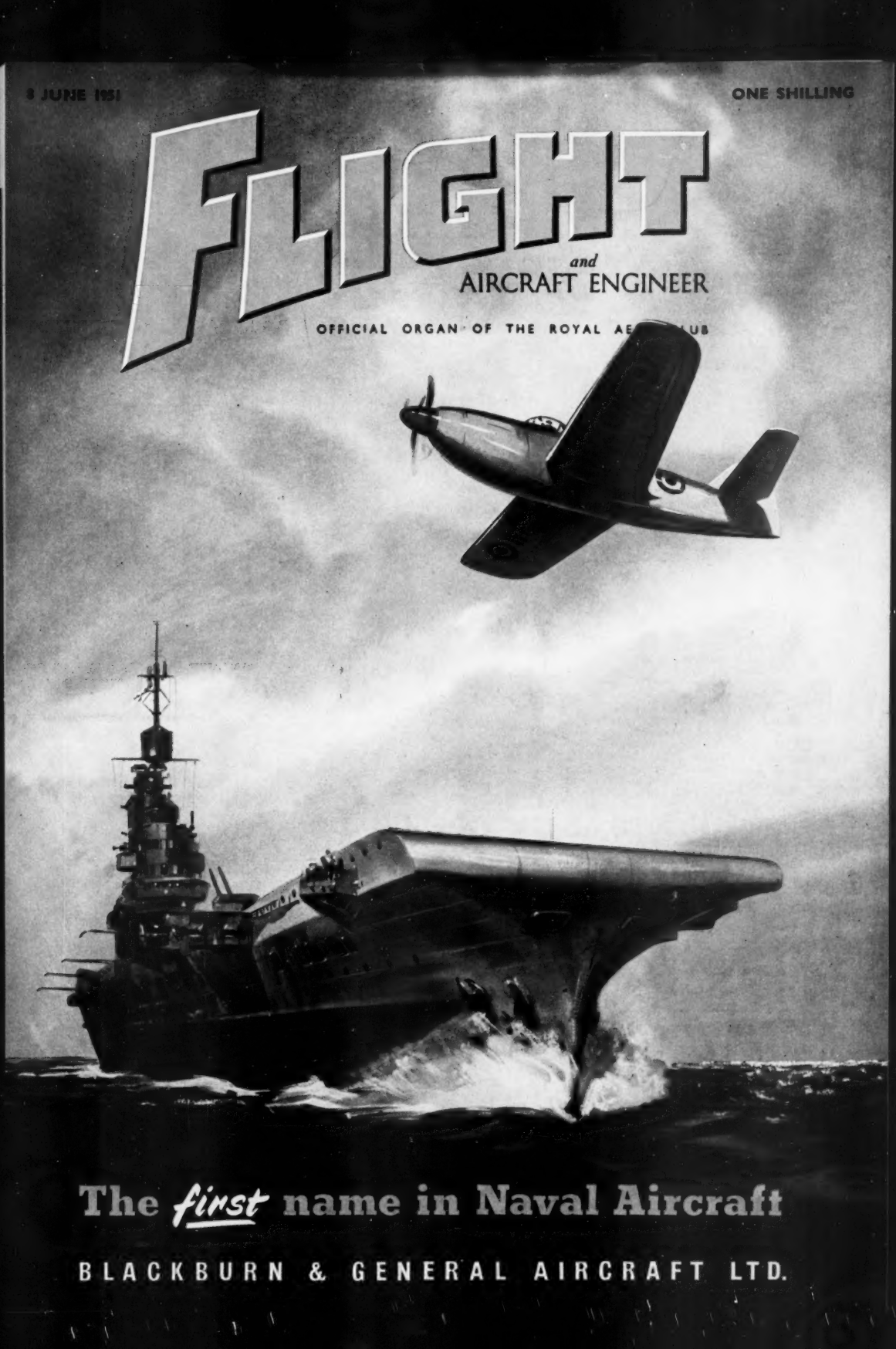

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About Aluminium... 4

MECHANICAL PROPERTIES · *tensile*

This article is one of a series by which it is hoped to make students more familiar with the nature and properties of aluminium and its alloys. Only the barest outlines can be presented, but these may serve as an introduction to this major structural material.

ALUMINIUM alloys offer a very wide range of properties, from those of the commercially pure metal on the one hand to those of advanced heat treatable alloys on the other. The range between is adequately covered by a large number of alloys, most of which are available in several conditions or tempers.

Behaviour under tension is generally considered the first yardstick of an engineering material, and the figure at the foot of the page shows typical tensile stress/strain curves for three different aluminium alloys and compares them with that for mild steel. The alloys are : commercially pure aluminium (Noral 2S) in the fully annealed state suitable for deep pressing ; a 5% magnesium aluminium alloy (Noral A56S) after strain-hardening, by rolling, to the "half-hard" temper ; a zinc-magnesium-copper aluminium alloy, known as Noral M75S and used in aircraft construction, after solution treatment and ageing.

Modulus of Elasticity

It will at once be obvious that the strain per unit increase of stress is much higher for the light metal than for steel, in fact the Elastic Modulus is about one third, being between 9½ and 10½ million lb. per sq. in. for most aluminium alloys.

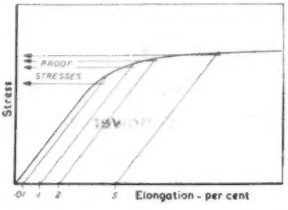
If, to effect a weight saving of 66⅔%, a steel structural member is replaced by one of identical form in an aluminium alloy of equal strength, elastic deflection will be about three times as large. Should this be objectionable, a redesigned member of equal stiffness will weigh about half as much as the steel one instead of a third.

This relatively low stiffness is an advantage under shock or impact loads, which, by virtue of the large elastic deformation, are absorbed well by the aluminium alloys.

Proof Stress

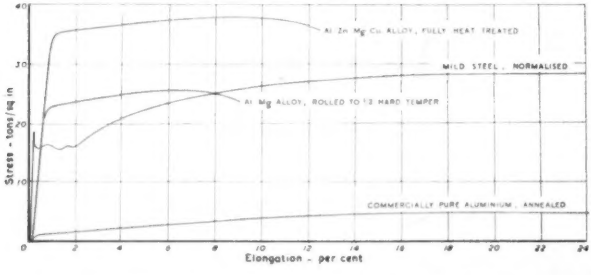
No clearly defined elastic limit or yield point is to be seen on stress/strain curves for aluminium alloys, so the point of departure from the elastic range has to be defined arbitrarily. For convenience in routine testing, a point is chosen at which the permanent deformation is easily measured : in this country, a permanent set of 0.1% of the original gauge length, abroad more usually 0.2%. To mark the limit of proportionality closely, 0.01% set is sometimes used.

The stress at which a 0.1% set is observed is called the 0.1% *proof stress*, and, because it reveals the onset of plastic movement, is often of more value to the designer than is the ultimate stress.



The figure above shows how it is obtained from a stress/strain diagram.

Some alloys, notably the heavily strain-hardened ones, have a high ratio of proof strength to ultimate strength ; in 2SH for example the 0.1% proof stress is 9 tons per sq. in. and the ultimate stress 10 tons per sq. in. Generally the ratio of proof to ultimate varies from 35% for soft tempers to 90% for the hardest ; in the fully heat treated alloys it is about 80%. Although a high proof stress is in itself an advantage, a high proof stress/ultimate stress ratio implies a low ductility.


Al Zn Mg Cu ALLOY, FULLY HEAT TREATED
MILD STEEL, NORMALISED
Al Mg ALLOY, ROLLED TO ½ HARD TEMPER
COMMERCIALLY PURE ALUMINIUM, ANNEALED
Stress - tons/sq in
Elongation - per cent

Elongation

The amount of permanent stretch at the instant of breaking is a useful guide to the ductility of a metal, and a minimum value is usually demanded by light alloy specifications. It is not, however, an infallible index of workability, and selection of an alloy for forming operations should never be made on this basis alone.

Elongation may be found by clamping the pieces of a broken test specimen together and measuring between marks applied before starting the test. It is generally expressed as a percentage of the original gauge length of the test specimen. Elongation is not equal everywhere in the specimen but is greatest around the fracture ; the gauge length chosen will therefore affect the value very much, and is always specified.

A gauge length of 2 inches is a common standard in this country. For better comparison of different sized specimens, the length may be referred to the original cross-sectional area ; thus $4\sqrt{\text{Area}}$ is frequently used, especially for round sections. In Europe, gauge lengths of $11.3\sqrt{\text{Area}}$ and $5.65\sqrt{\text{Area}}$ (equivalent to 10 and 5 diameters for round specimens) have long been standard.

Typical elongation values for aluminium alloys vary from 35% (on two inches) in annealed material to as little as 3% in fully strain-hardened metal. The heat treated alloys, even the strongest, possess a fair elongation, ranging from 9% to 20%.

Strength/weight ratio

It will be seen that the strength of an aluminium alloy may exceed that of mild steel. If the weight of the two materials has to be considered, aluminium is able to compete with the high-tensile steels.

A rough indication of the structural merit of a material, at least under tension, is given by its *specific* 0.1% *proof stress*. This empirical figure, useful only for comparison, is obtained by dividing the 0.1% proof stress by the specific gravity. A similar idea is sometimes expressed as the length of uniformly cross-sectioned rod of a material that could be suspended before it broke under its own weight. On this basis, a commonly used alloy of the heat treatable type, Noral 26S, is over three times as effective as mild steel.

The fifth article in the series will touch on some other mechanical properties.

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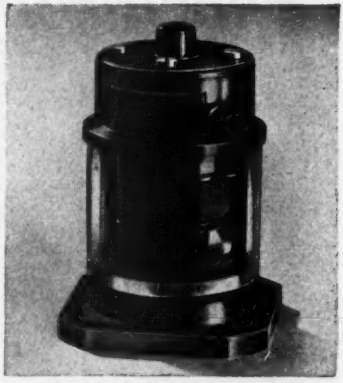

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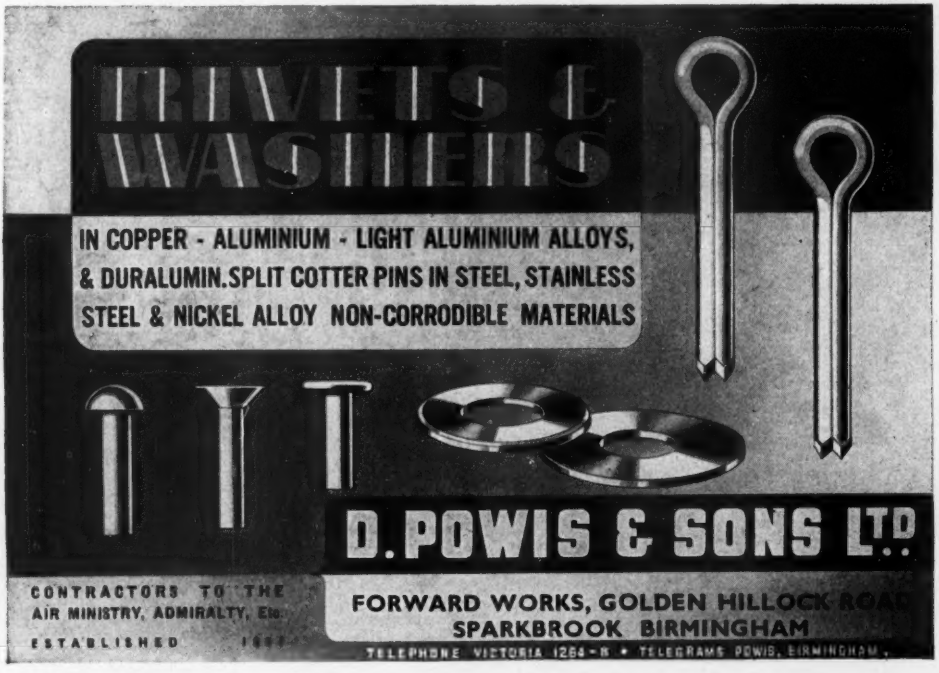
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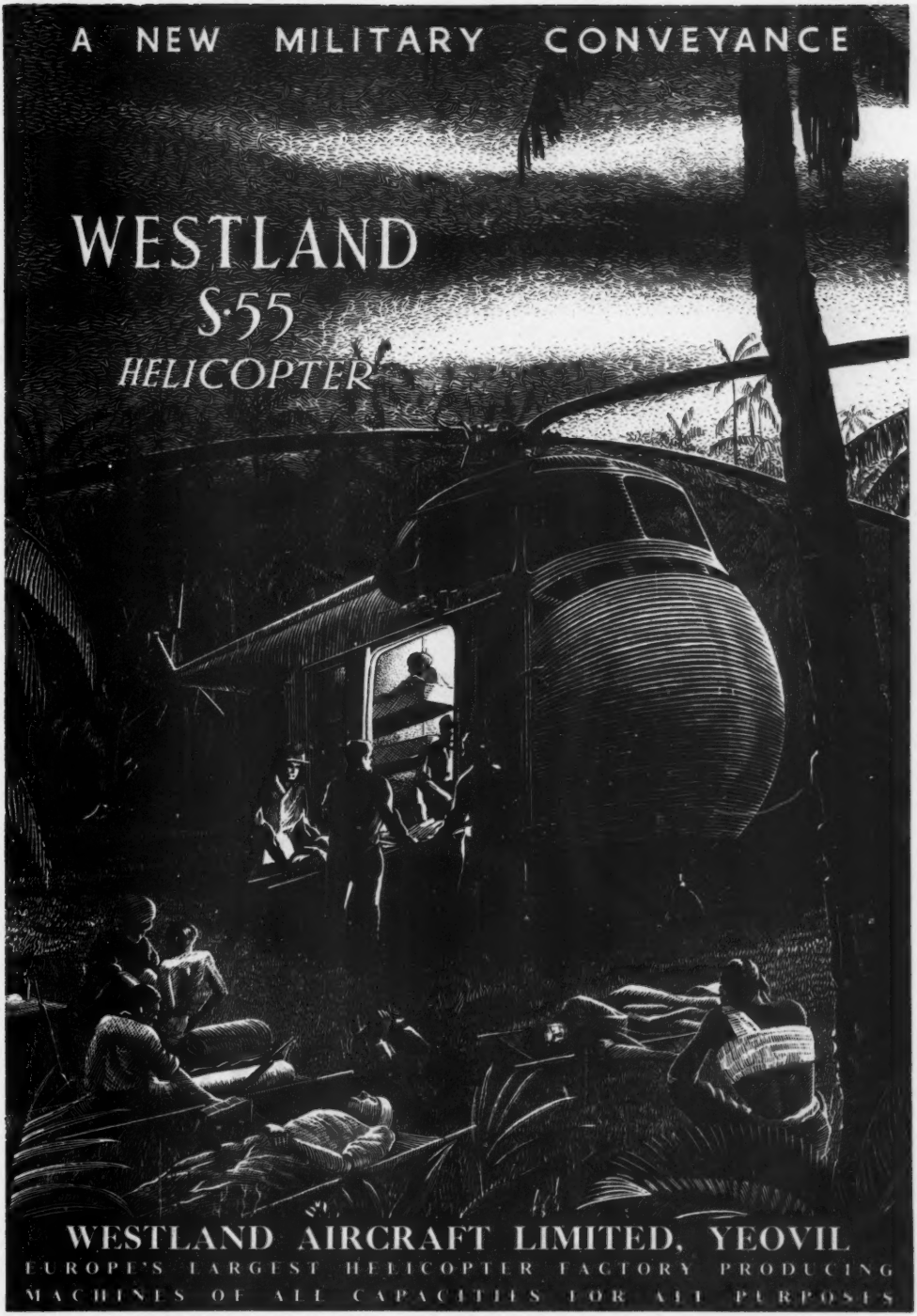
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THE PROBLEM OF MATERIAL AND LABOUR SHORTAGE

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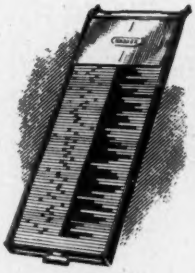

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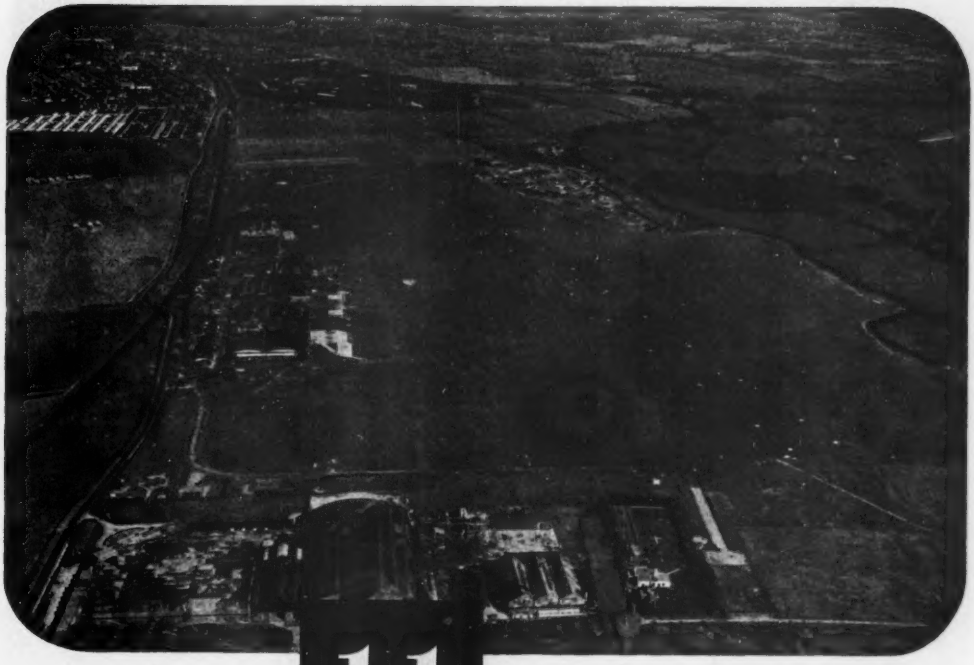
Do you know your airfields?



11

Recognize this airfield? It's No. 11 in this series of puzzle photographs. You'll find the answer below on the right. ★

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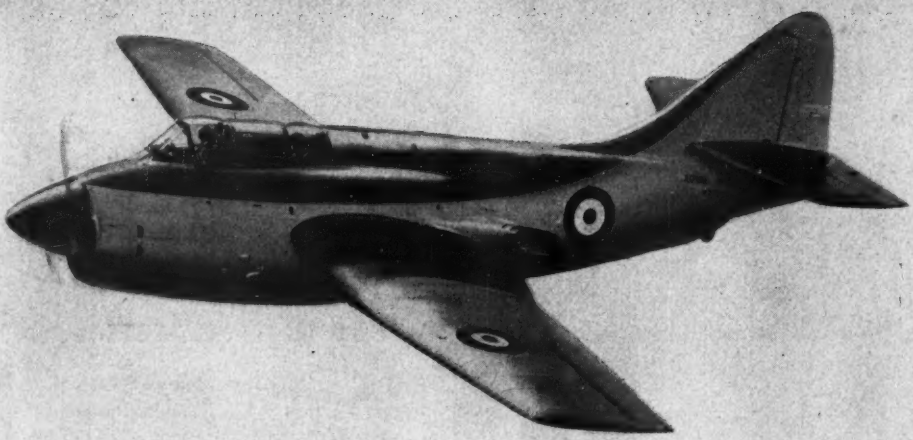

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Vandenberg on Russian Jets

GENERAL VANDENBERG, Chief of Staff of the United States Air Force, must have made his audience sit up and take notice when he testified recently before the Senate committee charged with investigating the dismissal of General MacArthur. The Soviet Mig-15 jet fighter, he avowed, had greater speed and climbing power than U.S.A.F. fighters in Korea, though he did admit that the F-86 Sabre possessed "some slight advantage in range." Moreover, the technical superiority of the Mig was offset by American training and gunnery control, and this was why U.S. pilots were able to inflict heavy casualties on the enemy without suffering anything like the same losses themselves. But that the Mig should be credited with a higher speed than the Sabre is, to say the least, unpleasantly surprising, especially so as there is not the remotest prospect of the R.A.F. obtaining fighters capable of matching even the Sabre's speed before many perilous months have elapsed.

Of the turbojet in the Mig-15 General Vandenberg is reported to have said: "The engine is a very marked improvement on the Nene which the British sold to them," adding: "It was made and developed in Russia, possibly with the help of German technicians; but any thought that it is due solely to those technicians is fallacious."

The General's biggest bombshell, however, was the assertion that the power plant of the Mig was "superior to any jet unit we have today." Even though this has been interpreted in America as referring only to American turbojets used in Korea it is—if proven—most disquieting, for the F-86A Sabre is fitted with the axial-flow General Electric J-47 of 5,200 lb thrust, while the U.S. Navy has been operating carrier-borne Grumman Panthers powered with centrifugal-flow Pratt and Whitney J-42s, similar to the Rolls-Royce Tay and delivering 6,250 lb of thrust without afterburning.

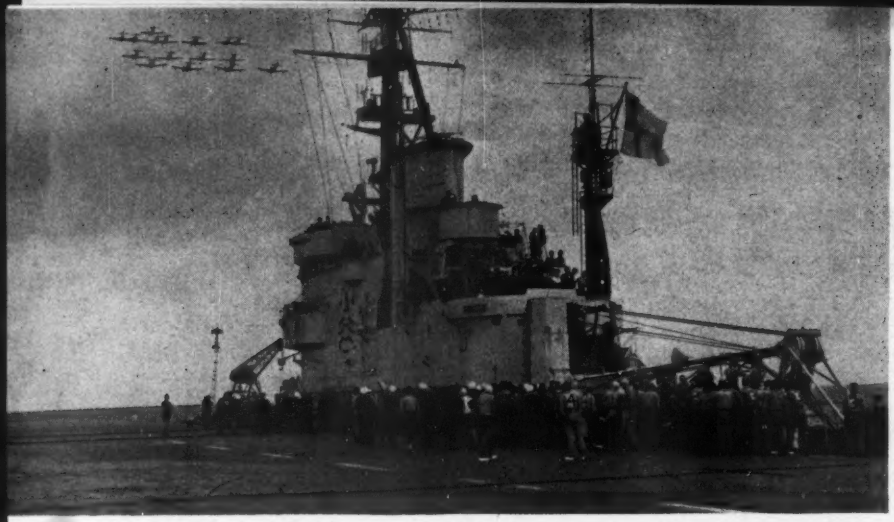
It is our own belief that, while General Vandenberg is to be commended for his timely and salutary observations, his opinions on the quality of Russian jet units should not be swallowed without a slight seasoning of salt. To be as frank as the General himself, we do not believe that the most capable Russo-Germanic team of technicians could have made a better job of developing the Nene than have the finest brains of Rolls-Royce and Pratt and Whitney; nor are we disposed to believe that the Russians can match the Avon, Orenda or Sapphire, or any of the very powerful turbojets now running in America. We do, however, firmly support the General in his endeavours to drive home a discomforting fact—that Russia possesses fine aircraft in large numbers.

B.E.A. and L.A.C. Fleets

BRITAIN'S civil aircraft fleets have been in the news during the last week or two as a result of B.E.A.'s difficulties arising from lack of aircraft and the changed ownership of a fleet of 23 Yorks. Both subjects are referred to on page 683. To comment on the second one first, we would express satisfaction that a British private company has been able to assemble such a sizeable and adaptable merchant air fleet—Yorks and Haltons—as is now to be operated by the Lancashire Aircraft Corporation.

B.E.A.'s difficulties arise from delays in delivery of Ambassadors (Elizabethans), and, to a lesser extent, of the Pionairs. Latest information about the Ambassadors, of which there are now five, including prototypes, the flagship and *Sir Francis Drake*—the first production and principal trials aircraft—is more encouraging. The modified elevator is fitted and flying with the desired result achieved. In particular, elevator control under such extreme conditions as a glide approach and landing at full forward c.g. and high landing weight is now satisfactory. Strangely enough, the minor deficiencies which have now been rectified in the Ambassador could not be detected in the prototype but only in the production aircraft. The authorized maximum a.u.w. is now 52,000 lb.

If no more bad luck such as the two landing mishaps delays progress, there seems to be no reason why the first Ambassadors should not, after all, be delivered this summer with a C. of A. permitting immediate operation on most European routes and including a light-icing clearance. Full icing trials—of airframe, engines and airscrews—and tropical tests have still to be completed, and in this connection an Ambassador is expected soon to fly to Khartoum. Suitable conditions for icing trials may be sought in Scandinavia.



Illustrated
by
"Flight" Photographs

Flying over the ship in salute, the 17th Carrier Air Group, comprising 807 and 810 Squadrons, set course for Lee-on-Solent.

"THESEUS" COMES HOME

Welcoming Ceremony at Portsmouth and Presentation of Boyd Trophy by Lord Fraser

UNDER a grey sky and in a drizzle of rain on Tuesday morning, May 29th, the light fleet carrier H.M.S. *Theseus* steamed slowly up Spithead to Portsmouth. It was nine months since she had been in these waters, and during that time she had not only upheld the greatest traditions of the Royal Navy, but had lifted the prestige of British Naval Aviation to a level which, although it may be matched, will probably never be eclipsed.

As she approached the harbour entrance, signal lights blinked their welcoming messages from Fort Blockhouse, Gilkicker Point Fort Vernon and the dockyard signal tower. Slowly the ship came alongside the South Railway Jetty, and the packed ranks of waiting parents, wives, sweethearts and children raised continuous cheers; they vigorously waved handkerchiefs, and then started singing "All the nice girls love a sailor" and "There'll always be an England." Gently the dockyard tugs nosed the ship alongside; heaving lines were thrown and hawsers secured; the Jack and the White Ensign were hoisted and, simultaneously, the ship's visual call-sign was lowered. *Theseus* was home.

By invitation of the Admiralty, we were able to join *Theseus* at Falmouth on the Monday morning for her journey up-Channel. When we arrived there were grey skies and a hint of rain in the mild Cornish atmosphere, but by lunch-time the clouds had lifted away before a fresh easterly breeze, and the sun shone brightly to make the dark blue-green sea glint and sparkle.

At four o'clock in the afternoon we weighed anchor and steamed out into the Channel. Thirty-five minutes later the signal "start engines" was given from Flying Control, and simultaneously the Sea Furies and Fireflies ranged on deck belched blue smoke and started their airscrews turning. The 13 Sea Furies were all catapulted off, led by the Air Group Commander, 17th C.A.G., Lt. Cdr. P. M. Gordon-Smith, D.S.C., R.N., and here we were able to see some measure of the ship's efficiency, for the average interval between launches for the whole Sea Fury squadron was but 44.5 sec, and this included the fitting of a new catapult strop. We were told, however, that this was "not particularly good"; *Theseus* generally reckoned to achieve an interval of 42 sec and, in fact, on one occasion had got down to 40.2 sec. The Sea Furies were followed by four of the six Fireflies—the remaining two were delayed in order to take press photographs ashore—and all the Fireflies made free take-offs with an average interval of 14 sec. The Air Group then formed up into four flights of four abreast in line-astern with the A.G.C. in the lead position and, to the accompaniment of spontaneous cheers from those on deck, flew directly over the ship in salute and headed for Lee-on-Solent.

Capt. A. S. Bolt, D.S.C., R.N., commanding *Theseus*, said of the ship's tour of operations in the Far East that, although it seemed not to be generally realised in this country that the British contribution to the war in Korea was not numerically as great as it might be, they in *Theseus* had realised it, and so felt that the ship had to do "a quality job." Britain's light fleet carriers had been built too late to engage in the last war, but we had more light fleets than any other type of carrier, and in the event of another war, they would be the mainstay of Naval Aviation. For this reason, *Theseus* was worked hard in order to show up any weak spots. In the event, it had been an agreeable surprise, for the ship stood up to operational conditions very well.

Capt. A. S. Bolt, D.S.C. and Bar, R.N., Captain of the ship, and his Commander (Air), Cdr. A. F. Black, D.S.C., R.N.

Since the war, the personnel of Naval Aviation had been largely reorganised, partcularly the maintenance side. The Korean tour had been the first real test of the new maintenance scheme, and the serviceability record of the Air Group spoke for itself. The aircraft were sound and were well-made, but they had needed a good deal of work done on them, and had constantly been operated—very successfully—at full load. Of the aircrews, Captain Bolt said that their flying had been exceptionally good, but that this was, perhaps, only to be expected, because they largely comprised regular general-service officers whose experience was greater than would perhaps normally apply. Many of the pilots were potential squadron commanders, and would undoubtedly become so in the event of war in the comparatively near future. The ship's company had been first-rate. Mostly the men were on seven- and five-year engagements, but there were a good many Reservists.

Theseus took over from *Triumph* last September, and started operating on October 9th. At the end of October she went down to Hong Kong to take part in exercises for the Hong Kong Defence Forces, this being the other part of the ship's rôle in the Far East theatre. In December, however, when the Chinese suddenly entered the struggle, *Theseus* left the exercises in a hurry, and from December 5th to December 28th operated virtually non-stop. The operational cycle embraced intensive flying to the extent of roughly 50 sorties per day for four consecutive days, followed by one day for replenishment; this was followed by four or five days continuous operation, after which the ship went back to harbour for provisioning, re-arming, etc.; then the cycle started again. For the most part, the ship was operating in the Yellow Sea

between 30 and 50 miles off-shore, and roughly abreast the bomb-line. *Theseus* always had a destroyer screen, which frequently included Commonwealth ships, although on one occasion a Dutch destroyer joined the force. Naturally enough, a high degree of readiness was maintained, and the ship always had aircraft on combat air patrol.

During her operational period from October 1950, to April this year, *Theseus* achieved "vital statistics" which are remarkable by any standard but which, in relation to a light fleet carrier which never had more than 35 aircraft operating at any one time, are outstanding, and deservedly won the highest commendation. During the six-month operational period, the Air Group flew 3,446 operational sorties; fired 523,220 rounds of 20 mm. shells; fired 6,617 × 60 lb rockets; and dropped 1,390 × 500 lb bombs, 84 × 1,000 lb bombs and 80 depth charges. Of the 4,613 deck-landings made, no fewer than the extraordinary total of 1,434 consecutive landings were accident-free, and what is more, after three or four minor accidents, the second thousand accident-free landings was very nearly completed by the time the ship left for home—939, to be exact. All operational take-offs were catapult launches, and numbered 3,606, whilst the hours flown by the Air Group totalled 10,208. These figures embraced 115 flying days, and the average number of hours achieved by each pilot was 269.

It is apposite to quote two signals received by the ship on her departure from the Far East:—

To *Theseus* From Commander Naval Forces Far East (U.S.A.)

Theseus and embarked airmen have set high standards for all aircraft carriers during their most effective tour of duty with the United Nations Forces. We have admired your quiet and confident way of always doing more than the schedule called for. It has been a privilege to have such a fine unit share this campaign with us. Well done. Good Luck. God Speed on your homeward voyage.

(Signed) C. T. Joy. Vice-Admiral U.S.N.

To *Theseus* From Commander Seventh Fleet (U.S.A.)

Your fine performance in this Korean show has added new lustre to the brilliant traditions of the British Navy. It has been a privilege to have you in the Seventh Fleet. Good luck and may we be shipmates again.

(Signed) Vice-Admiral Martin, U.S.N.

Conversation with various pilots of the Air Group revealed whole-hearted and universal approbation for the helicopter. *Theseus* had not a helicopter of her own, and the pilots were thankful for the aid of U.S.N. Sikorsky 51s which, in all, rescued eight of the Air Group. For the ship's last operation, the Americans loaned a helicopter complete with pilot; it rescued two aircrew in three days.

We were also told that the Sea Furies were able to fly with only four R.P.s at a time as, if more were carried, the fins hit the underwing long-range tanks in firing. Nevertheless, on the credit side, the magnificent behaviour of the aircraft and engines in affording the Air Group a constant serviceability factor of well over 90 per cent is notable—as is the fine work of Commander (E) G. A. Thompson, R.N., the Air Group Engineer Officer, and his team.

Admiral of the Fleet Lord Fraser presents the Boyd Trophy to Lt-Cdr. Gordon-Smith in commemoration of the magnificent work of the 17th Carrier Air Group in Korea.

With the ship secured alongside the jetty, and a swarm of visitors invading her; with fond reunions taking place everywhere and sailors pointing out "this is where I sleep," and "no, those are only signalling guns," everybody awaited the coming of the First Sea Lord for the Boyd Trophy presentation ceremony. The rain had stopped, the clouds lifted a little, and the sun was even making a brave attempt to break through when, at 11.15, the Admiral's Barge came across the harbour from Gosport and brought up alongside the King's Stairs. At 11.25 precisely, Admiral of the Fleet Lord Fraser of North Cape, First Sea Lord and Chief of Naval Staff, arrived on the flight deck, accompanied by Captain Bolt. He took the salute of the Royal Marine Guard of Honour, met the distinguished guests, and then inspected the ship's company, who were mustered on the forward part of the flight deck as for Sunday Divisions. Finally, Lord Fraser inspected the Air Group, whilst the ship's company formed up in dense ranks to define the forward line of a square abreast the island.

Mounting the rostrum, the First Sea Lord welcomed the ship home with the words: "I have been following your story and your work although 5,000 miles away in London, and with particular interest because I myself have been a captain of a carrier. I know that you have had to endure all conditions and all sorts of weather, but from your record it is obvious that, even if this country can't always be present in quantity, its quality is first-class. The prestige of the Royal Navy is at the highest possible level in our country to-day. You have set an example of how things should be done. I must emphasize that the work of the carrier if it is to be successful depends on an all-out effort by all ranks, and everyone in this ship has shared in it. Welcome home and a happy leave."

Lord Fraser then presented the Boyd Trophy, a silver model of a Swordfish, to Lt. Cdr. Gordon-Smith, whilst everybody clapped and cheered. Captain Bolt mounted the rostrum and led the ship's company in three cheers for the First Sea Lord. Thereafter, he commanded "*Theseus*—dismiss" and, with a tremendous spontaneous cheer, the ranks broke.

Five of the Air Group pilots who were shot down and rescued: left to right, Lt. Keighley-Peach, Lt. I. Bowman, Lt-Cdr. Gordon-Smith, Lt. I. Hamilton, Commissioned Pilot N. Bailey, and Aircrewman J. Loveys.

THE RADAR HEARING

MARSHAL OF THE ROYAL AIR FORCE Lord Douglas of Kirtleside, former C.-in-C. Fighter Command, and Lord Swinton, Air Minister from 1935 to 1938, gave evidence before the Royal Commission on Awards to Inventors in London on May 29th. They were supporting a claim for an award brought by Sir Robert Watson-Watt and his team of ten scientists for their part in the invention and development of radar.

Lord Douglas thought the Battle of Britain would not have been won without the radar chain. The most intensive period of his connection with radar came when he took over Fighter Command in October, 1940. We had started to suffer from some "pretty intensive night bombing." At that time our fighters were having extraordinarily little success. "In the Coventry raid," Lord Douglas went on, "not a single bomber was brought down, although it was quite a bright, clear night. The radar chain was extremely useful in telling us that the night bombers would come along, but we found that we could not get our night fighters into position to see and shoot down the enemy bombers." Suddenly, two or three months later, "the technique seemed to flower."

Lord Swinton recalled that during his tenure of office one of his principal scientists had told him: "That man Watson-Watt! Whatever you do, you must buy him, body and soul." When Sir Robert told Lord Swinton that he intended to write a paper for the Royal Society on his discoveries the answer was: "My boy! You won't write anything about them for a very long time."

FROM ALL QUARTERS

Out-and-home Record for P. A. Wills

SUBJECT to confirmation, a new British out-and-return record for single-seat sailplanes was established last Sunday, June 3rd, by Mr. Philip Wills, who is president of the British Gliding Association. Flying his Weihe, he covered a distance of 160 miles, from Redhill to R.A.F. Station Little Rissington, and back. The flight occupied about 6¼ hours.

Airframe Structures in Plastics

THE British Plastics Exhibition is now in progress at Olympia, London, and remains open until June 16th. Concurrently with the show, the British Plastics Convention is taking place, at which papers are being read by specialists in every branch of the plastics industry and by others well versed in the use of plastics in particular spheres.

Among these papers is one entitled "Aircraft Plastics Structures." It will be read during the afternoon of June 13th by H. Warburton Hall, M.Sc., and J. E. Gordon, B.Sc., of the R.A.E., Farnborough. The authors will review existing uses and requirements for plastics in aircraft—principally transparencies, both optical and electrical—and then go on to speak of current work on the development of major airframe structures in plastics.

The Exhibition and Convention are organized by *British Plastics*, an Associated Iliffe Press journal.

Engineering Aspects of Aviation

FOUR important papers on various aspects of engineering in relation to aviation are being read at a London conference organized jointly by three learned societies—the Institutes of Mechanical, Civil and Electrical Engineering. All four papers will be given in the lecture theatre of the Institution of Mechanical Engineers, at Storey's Gate, London, S.W.1.

Today, June 8th, at 10 a.m., Mr. F. M. Owner, M.Sc., F.R.Ae.S., M.S.A.E. (chief engineer, engine division, Bristol Aeroplane Co., Ltd.) will present a paper entitled "The Application of Power to Aircraft."

On the morning of Monday next, June 11th, two papers will be given: Prof. A. G. Pugsley, O.B.E., D.Sc., F.R.Ae.S. (Professor of Civil Engineering, University of Bristol) will speak on "The Development and Design of Aircraft Structures"; and Mr. J. A. Dawson, C.B.E., B.Sc.(Eng.), M.I.C.E. (chief resident engineer, London Airport) will discuss "Planning and Construction of Airfields."

On Tuesday, June 12th, at 10 a.m., the fourth paper will be delivered, under the title "Forty Years' Progress in Air Radio"; the authors are A.Cdre. C. S. Cadell, C.B.E., M.A., Ing. E.S.E., A.M.I.E.E., and B. J. O'Kane, Ph.D., B.Eng., A.M.I.E.E., respectively managing director and chief engineer of International Aeradio, Ltd.

The New Minister of Civil Aviation

SUCCESSOR to Lord Pakenham (who has become First Lord of the Admiralty) in the post of Minister of Civil Aviation is Lord Ogmore, T.D. The King's approval of the appointment was announced last Friday night, June 1st.

Born in 1903 and educated at Mill Hill School, D. R. Rees-Williams, as he then was, received legal training and practised as a solicitor in his native South Wales and, later, in the Straits Settlements. He served in the Army from August, 1939, to October, 1945, and as a lieutenant-colonel, R.A., was chief legal officer in British Military Government, Berlin Area. In the 1945 General Election he became Labour member for Croydon South, and from 1947 to 1950 was Parliamentary Under-Secretary for the Colonies. Contesting Croydon West in the 1950 Election he lost his seat to the Conservative candidate, but returned to Parliament in June, 1950, on being made a peer. Between 1946 and 1948 he paid a number of duty visits to East and West Africa and other parts of the Commonwealth.

Lord Ogmore

With the announcement of the appointment came an end to the rumours—which had been gaining increasing currency during the week—that the Government intended to wind up the Ministry of Civil Aviation and combine its functions with those of the Ministries of Transport and Air.

A 665-m.p.h. "Routine"

MICHAEL COOPER-SLIPPER, Avro Canada test pilot, has flown an Orenda-powered F-86 Sabre from Toronto to Montreal in 28 min. 34 secs, at an average speed of 665 m.p.h. The trip—as now seems to be the custom on such occasions—was described as "routine."

D. H. Capital Issue

THE Directors of the de Havilland Aircraft Co., Ltd., announce that, the consent of the Treasury having been obtained, they propose to make the following issues immediately after (and subject to the passing of the necessary resolutions) at an extraordinary general meeting to be held on June 19th :—

(1) An offer to Ordinary stockholders for subscription in cash at 20s per share, of 1,644,547 Ordinary shares of £1 each in the proportion of nine new Ordinary shares of £1 for each £10 nominal amount of Ordinary stock held.

(2) The allotment to Ordinary stockholders of 913,637 Ordinary shares of £1 each, credited as fully paid, in the proportion of one new Ordinary share of £1 for each £2 nominal amount of Ordinary stock held, by way of capitalization of £913,637, being part of the share premium account (premiums received on issue of Ordinary shares). Particulars were posted to stockholders on June 1st.

Solo Over the North Pole

CAPTAIN CHARLES BLAIR, the P.A.A. senior captain who flew a Mustang from New York to London in 7 hr. 48 min. last January, made another and even more remarkable solo flight last week.

Using the same Mustang, *Excalibur III*, which has a Packard-built Rolls-Royce Merlin engine, he took off from Bardufoss, Norway, at 15.18 hr. G.M.T. on May 29th, in an attempt to cross the North Pole and land at Fairbanks, Alaska, 3,375 miles distant. All went well, and he reached his goal in 10 hr 29 min, which represents an average speed of 321.4 m.p.h. After re-fuelling, and a few hours' rest, he then flew another 3,400 miles on to New York, which he reached at 20.40 hr on May 30th—a little over 29 hours after leaving Norway.

From his take-off point to the Pole he followed the 20th meridian and then the 160th meridian, which gave him a landfall at Point Barrow, Alaska. During the expected period of compass-disturbance over the Pole, Blair navigated by the sun.

He is reported to have flown most of the way at 15,000ft, but to have climbed to 22,000ft during the actual polar crossing.

He was out of radio contact during the major part of the Norway-Alaska stretch, his last conversation being with a Catalina of the Royal Norwegian Air Force in the Spitzbergen area. Previously, on his initial flight from Oslo to the take-off point, he had been escorted by Norwegian Vampires.

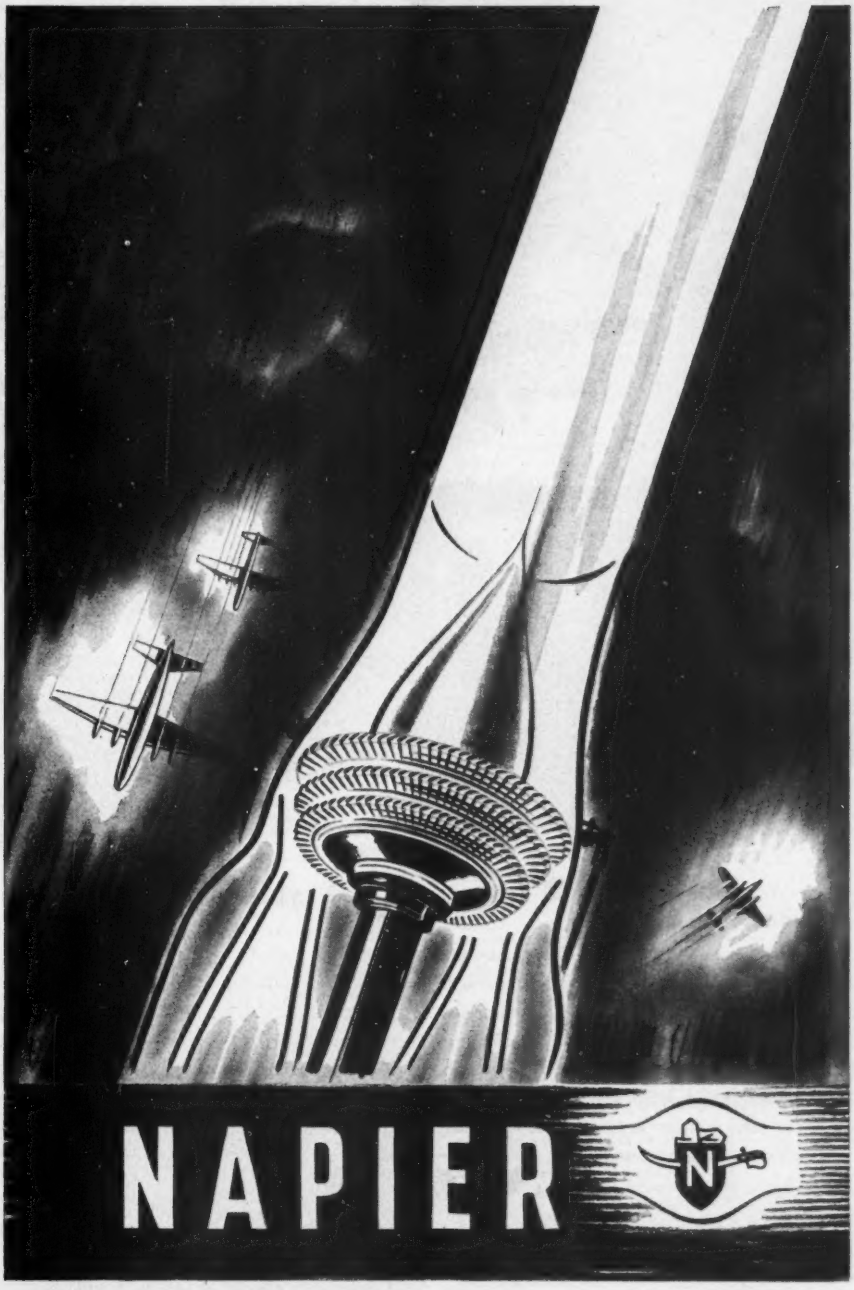
Capt. Blair's achievement represents the first solo crossing of the polar regions. His route approximated to that of the 1925 penetration by Amundsen and Ellsworth in Dornier Wal flying-boats (it is an interesting coincidence that they, too, had Rolls-Royce engines), and to the course flown from Spitzbergen to Alaska by the airship *Norge* (Nobile, Amundsen and Ellsworth) in 1926.

Large Aircraft—Small Scale

AT London Airport on Friday, June 1st, a practical demonstration was given, with a B.O.A.C. Hermes, of an extremely neat hydrostatic weighing unit which, now being manufactured by Alltools, Ltd., Brentford, Middlesex, was designed and developed by B.O.A.C.—primarily for Corporation aircraft.

The unit consists of a body, a cylinder and a piston, which form a sealed pressure chamber. Fluid pressure created by the load is transmitted directly to a pressure tube, the movement of which is measured by a triple scale precision instrument. The dial is graduated in 100 divisions, and the pointers appropriately indicate units, hundreds, and thousands, which are graphically convertible into weights.

Together with markedly robust design and extraordinary compactness (the six-ton model measures but 8in by 5in by 5in) the unit offers great accuracy of measurement, the average throughout the capacity range being, in fact, one part in 2,000. The pressure chamber is filled with non-freezing fluid, and the unit is unaffected by normal variations of temperature, humidity or dust. Although devised primarily for aircraft application, the nature of the weighing units is such that they are readily applicable to a wide range of employment. The standard range of units offered at the present time comprises two-, six-, ten-, 16- and 25-ton capacity models, but special equipment can be manufactured to suit any load. World distribution is in the hands of Kenton Equipment, Ltd., 48, Brook Street, London, W.1.



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It operates profitably on passenger or freight transport of all kinds, including feeder-line service or charter; it will prove its economical worth to industrial concerns such as insurance companies, coastal fisheries, whaling undertakings; and it can fulfil a wide variety of useful duties for government branches—embassies, immigration authorities, coastguard, security, and forest patrol, to mention only a few.

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HONOURING THE JET PIONEERS

Hawker Siddeley Commemorative Dinner Marks Ten Years of Turbine History

Forming an appropriate setting for what will probably be remembered as THE jet dinner are the original Whittle unit, the Gloster aircraft built for it and on the right, in contrast, a fine example of the modern British axial turbojet, the A.S. Sapphire. The Chief of the Air Staff, Marshal of the Royal Air Force Sir John Slessor, is seen speaking to the truly remarkable assembly of guests. Sir Frank Spriggs, Air Chief Marshal Sir Alec Coryton and Sir Frederick Handley Page are (l. to r.) in the foreground.

MORE than one speaker at the dinner given by the Hawker Siddeley Group in London on May 31st to honour "the first ten years of jet-powered flight in the free world" remarked on the still-modern and wholly attractive appearance of the Gloster-Whittle E.28/39. By courtesy of the Director of the Science Museum the chubby little monoplane had been made available to grace the head of the banqueting room, in company with an original Whittle turbojet and a glinting Sapphire.

There was general acclamation when Sir Frank Whittle mounted to the E.28's cockpit and the little machine—still airworthy, in spite of its gruelling career—bobbed forward on its nosewheel, as if curtseying to the man who made its construction possible. Both Sir Frank and Mr. George Carter, designer of the E.28, must have derived as much satisfaction from their ten-year-old handiwork as from the amazing achievements which have stemmed from the Gloster-Whittle alliance. The whole occasion, indeed, was one for honest pride in a matchless British achievement, and it was one which the 300 guests, of many nationalities, will not soon forget.

MR. T. O. M. SOPWITH, chairman of the Hawker Siddeley Group, expressed the pleasure that he and his old friend and supporter, Sir Frank Spriggs, took in welcoming the distinguished company—especially Sir John Slessor, the Chief of the Air Staff, General Leon Johnson, Commanding General of all U.S. Forces in this country, and Lord Trenchard, described by Mr. Sopwith as "the R.A.F.'s father confessor and staunch supporter in the Upper House."

We knew, said Mr. Sopwith, that a few flights were made in Germany and Italy by machines using some form of jet propulsion at a slightly earlier date than May 15th, 1941, but he felt confident that the first flight by an aeroplane especially designed for a power unit substantially the same as those in use today was made by the actual machine present on that night—and this machine was made possible only by the empirical thought and dogged determination of one man—A. Cdre. Sir Frank Whittle. Many inventors had experienced great difficulty in getting the backing to carry them through their experimental stages, and this was encountered in no mean degree by Frank Whittle. However, initially by private enterprise and later with Ministerial backing—when results justified it—he had managed to produce a jet engine which took to the air like the proverbial duck to water.

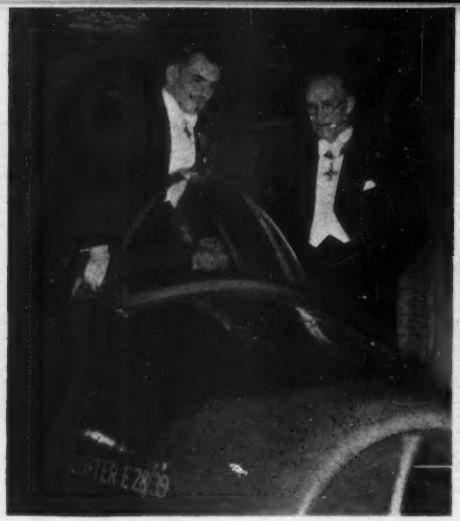
Sir Frank Whittle receives a presentation—the silver model of the E.28/39 is just discernible—from Mr. T. O. M. Sopwith, chairman of the Hawker Siddeley Group. A similar presentation was made to Mr. Carter.

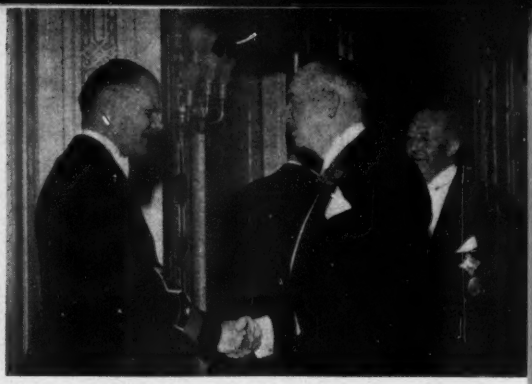
Mr. Sopwith remarked that in ten years the power of the first flight engine had been multiplied by ten: the Sapphire, in fact, swallowed air at the rate of more than three tons a minute—but it had been said that more hot air had been talked about the jet than had ever come out of it. If we had been able to help our American partners by giving them the technical "know-how," we looked to them for equal help from their unrivalled knowledge and ability to produce jet engines in large quantities.

Mr. Sopwith paid tribute to the memory of Jerry Sayer, Geoffrey de Havilland and Trevor Wade. He knew from experience that there came a time when there was a tendency to take a conservative line in design and development, but we who were born to aviation should never tolerate such an attitude; we must not temporize with progress.

A. CDRE. SIR FRANK WHITTLE rose to make a breezy and apposite reply. The fact that the E.28 was still serviceable after years of varied experimental work was, he said, the strongest possible testimony to the quality of the design and workmanship that went into it—and also to the skill of the late Jerry Sayer and the other Gloster test pilots who flew it. One of his regrets was that he never flew it himself—though he had a good try. He did, however, manage to fly the Meteor, and it was no exaggeration to say that it gave him the biggest thrill in the whole development. It was a great pity that such meagre records were kept of the historic events of May 15th, 1941. Sir Frank admitted that he was partly guilty himself because, though he kept an extensive diary, for some reason or other all he recorded for May 15th, 1941, was that the first flight of the E.28 took place and was "without incident." He also noted down the names of the Power Jets and Gloster representatives who were present. He himself was too close to the job to realize that he was witnessing the end of one chapter and the opening of a new one: it seemed just another small step in a long story. The full story had not yet been told, but Sir Frank disclosed that he was in the process of writing it up in some detail, though he was afraid some time would elapse before he could complete it.

Sir Frank emphasized that there was no doubt at all that his work on the jet engine would never have taken practical shape but for the initiative of two men whose contribution had, in his opinion, never received the recognition it deserved. They were R. D. Williams and J. C. B. Tinling. He recalled that he had taken out his first patent in 1930, but in the succeeding years had failed to arouse the interest of the Air Ministry or any private firm. When the patent came up for renewal in January, 1935, he had come to believe that it was before its time, and allowed it to lapse. Only four months later he was approached by Williams and Tinling and "prodded" by them into a revival of interest.





(Above) General Johnson of the United States Air Force—representing also General Vandenberg, who had hoped to be present—is seen at the reception with Mr. T. O. M. Sopwith and Sir Frank Spriggs (right).

(Left) The designers: Sir Frank Whittle and Mr. W. G. Carter pose with their historic Gloster E.28/39.

The action of Williams and Tinling started a chain of events which led to the formation of Power Jets in March, 1936.

Sir Frank recalled an occasion when Mr. Whyte, who was at that time chairman of Power Jets, and himself were invited to the headquarters of the Hawker Siddeley Group at Kenilworth. This was on October 3rd, 1939—a few days after Mr. Sopwith had visited Lutterworth to see a run of the experimental engine. On that occasion he himself had a technical discussion with Mr. George Carter, while Mr. Whyte had a commercial talk with Mr. Sopwith and Sir Frank Spriggs, who had since described that meeting as "an attempt to buy Power Jets body and soul." Sir Frank mentioned this fact partly to illustrate that the Hawker Siddeley Group were taking a very lively interest in the possibilities of jet propulsion, despite the fact that it was a long way from being fully proved.

In tracing the course of development Sir Frank emphasized that it was closely linked with the R.A.F. He mentioned W. E. P. Johnson, who, while an instructor at C.F.S. in 1930, had helped him to draw up his patent specification and later joined his team, and W/C. Lees, who had been an education officer in the R.A.F. and was lent to Power Jets as his deputy. But probably the largest R.A.F. contribution was the training it had given him—three years as an apprentice, a year as a cadet, two years on the officers' engineering course, and three years at Cambridge. While so many members of the Air Council were present, he suggested that the Service would benefit greatly if a few more officers were given a corresponding degree of training.

On the basis of the past ten years, it now seemed quite clear that the aircraft gas turbine, in one form or another, would replace the piston engine completely. However, his original target had not actually been achieved, for in 1935 he was thinking in terms of a 500 m.p.h. transatlantic airliner. The Comet promised to be the first machine to meet that target, and it was a matter of great satisfaction to him that B.O.A.C. would be the first airline to have it in operation.

MR. W. G. CARTER remarked that it was always easy to be wise after the event, but he took off his hat to the Hawker Siddeley directors for authorizing him, and the team which he had the honour to lead, to proceed with the design of an aircraft round the Whittle unit.

MARSHAL OF THE R.A.F. SIR JOHN SLESSOR claimed as one of the things of which the R.A.F. could be proud the fact that they had brought up in their apprentice school at Halton a boy who was to win world-wide renown in the field of engineering as Sir Frank Whittle. The emergence of jet propulsion and the appearance of the atom bomb, he said, had almost at one blow rendered obsolete for "purposes of major war" all the great reserve of conventional aircraft left over from World War II. We had to recognize today—in spite of our triumphs and the fact that the Americans were building the Sapphire and the Canberra under licence—that other people (and not only our friends) had in service jet aircraft that were in some ways superior to our own. There was, however, nothing very surprising about this, and Sir John said there must be many present who remembered the swing and sway of air superiority in 1916-17—the old Nieuport and 1½-Strutter giving way to the Camel, S.E.5 and Spad, as the Germans, in their turn, advanced from the old Fokker monoplane of the Somme days to the D.V, D.VII and Hannoveraner.

We now had aircraft coming along which would be the best in the world, but today the cycle of development was measured not in months but in years, so the danger periods were longer and more intense. Sir John could not help thinking that it was too long between the time when Whittle's idea of the turbojet was turned down by the Air Ministry in 1929 and when the first contract was placed with Power Jets in 1938. He wondered how history might have been altered if the E.28/39 had been the E.28/36. As "probably the most unmechanically minded man in the room," Sir John could say that we had today in the Air Staff and in the senior ranks of the R.A.F. a body of men who combined the right degree of technical and military judgment. He went on to praise G/C. Wilson and W/C. Donaldson, who broke the world's speed records with the Meteor 4; Mr. R. E. Bishop, who designed the Comet, and John Cunningham, its test pilot; S/L. Oxspring and the Vampire pilots of No. 54 Squadron, who took the first formation of jet fighters across the Atlantic in 1948; the pilots on the far-too-little-known delivery flights of 43 Vampires for our Far East Air Force and 20 Meteors for the Royal Australian Air Force in Korea; and S/L. Callard and his navigator and signaller, F/L.s Haskett and Robson, who flew the Canberra across the Atlantic in 4 hours 40 minutes.

Sir John reminded his listeners that we lived in times in some ways more dangerous than May, 1941. The R.A.F. was in the middle of a great expansion and in circumstances more difficult than when the whole energy and resources of our nation could be mobilized in defence against an enemy literally at our gates. But if we were resolute and patient, brave and steadfast, we need never be at war. We and the Americans had our differences; we were free nations and must learn that an essential freedom was to have different opinions "without calling each other names." But no one could doubt that if we were attacked we should find America with us. As long as we were not complacent and strove with all our brain and nerve and sinew to keep the lead we had gained in the air, Sir John believed that British and American air power could ensure the peace of the world for another hundred years, as British sea power secured it for a hundred years after Trafalgar.

GENERAL JOHNSON, who was not "on the programme," expressed regret that General Vandenberg was prevented from being present. He recalled that two months before Pearl Harbour a Whittle jet unit was flown to the U.S.A., so that there was Anglo-American co-operation even before the two nations were in the war together.

SIR FRANK S. SPRIGGS, managing director of the Hawker Siddeley Group, said that there was a lot of talk in this country about rearmament, but very few people knew what action had been taken. With the co-operation of our own Government, and the Governments of Canada and the United States, the Hawker Siddeley Group was collectively committed to the expenditure of over £30 million in machine tools and other equipment. For machine tools alone orders had been placed in the U.S.A., in this country and on the Continent to the value of over £24 million; deliveries would begin in the autumn of this year. For security reasons it was not possible to give the precise allocations of new equipment between the various companies in the Group, but Sir Frank said that these covered the whole Group and included aerodromes, factories, wind tunnels, aircraft and engine plants, guided missiles and rocketry. The addition of £30 million would bring the total Hawker Siddeley and governmental capital employed in the Group's business on rearmament to a figure of upwards of £70 million. It had been estimated that the Group would need about 25,000 additional workers in this country alone and immediate steps were being taken to get them.

(Concluded on page 682)

HERE AND THERE

SPORTING EFFORT: On June 1st the K.L.M. DC-4 freighter "Edam," seen here, left Manston, Kent, to accompany the "round the world in 30 days" venture by a team of drivers with an Austin A30 sports car. Piloted by Capt. J. J. Bak, it is carrying the car and its crews across the over-water stages (see page 510, "Flight," April 27th).

Royal Salute

NINETY-SIX R.A.F. and R.C.A.F. Vampires and Meteors were due to fly past Buckingham Palace yesterday, June 7th, official anniversary of the King's birthday.

Eager for Beavers

A SECOND order for Beaver "liaison" (communications) aircraft is reported to have been placed with the de Havilland Aircraft of Canada, Ltd., on behalf of the U.S. Army Field Forces.

For the Interested and Envious

OPENED last Friday, the new public enclosure at London Airport lies between the perimeter track and No. 1 runway, immediately in front of the control tower. Admission charges (11 a.m. to dusk): adults, 6d.; children, 3d.; cars, 1s. 6d.; motor cycles, 6d.

Death of a Pioneer

NEARLY five hundred people attended the last rites of the Rev. John Flynn, O.B.E., the medical missionary who was responsible for the inauguration of the famous "flying doctor" service in the inland parts of the Australian continent. His ashes were flown to Alice Springs.

For "Forceps" Read "Pliers"

A RECENT bulletin from the Flight Safety Foundation, New York, draws attention to mishaps that have occurred as a result of ground staff leaving tools on various parts of aircraft. It is suggested that the strict checking system used in surgical operations should be adopted as a preventive measure.

"Helicopter" Fighters

CONVAIR and Lockheed are reported to be working on turboprop intercepters for the U.S. Navy. They will have counter-rotating airscrews which can be used as helicopter rotors, permitting helicopter-like take-offs and landings. A development of the Allison T-40 is the power plant specified for the purpose.

Encouraging Ingenuity

"SUGGESTION AWARDS" are commonly made to employees in American factories, and Pratt and Whitney report that during the past year they paid out $24,231 (approximately £8,660) for this purpose. Where the saving made by a suggestion can be assessed, the employee is usually rewarded with 20 per cent of the sum.

Jet Royalties

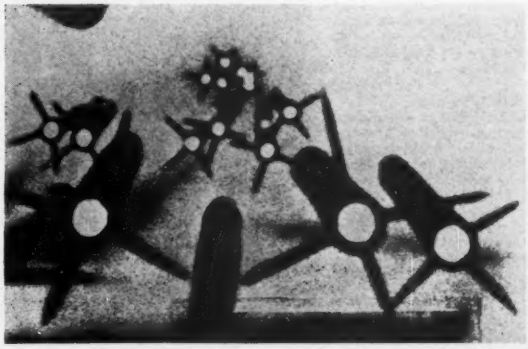
ABOUT $2,170,000 was received from the United States in 1950 in respect of British gas turbines, according to a Parliamentary answer given last week by the Chancellor of the Exchequer. He expected the 1951 figure to be larger.

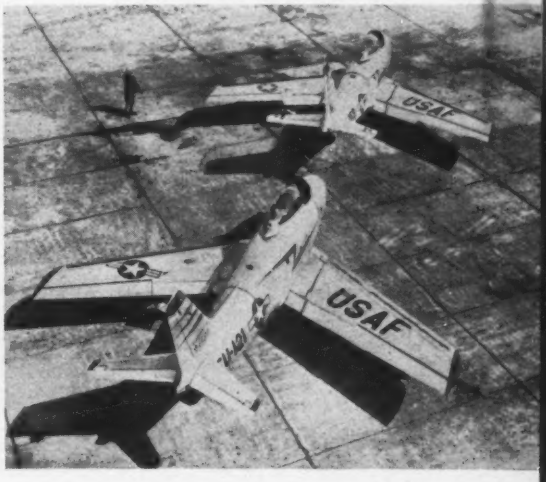
Tourist-fuel Rebate

NOW that the summer programme of Continental rallies is under way, private pilots are reminded of the fact that a rebate of 1s. 6d. per gallon can be claimed for all fuel purchased in the United Kingdom and consumed on flights outside its borders. Application for refunds must be made at the Customs airport from which the aircraft departs.

Pursuit Ship

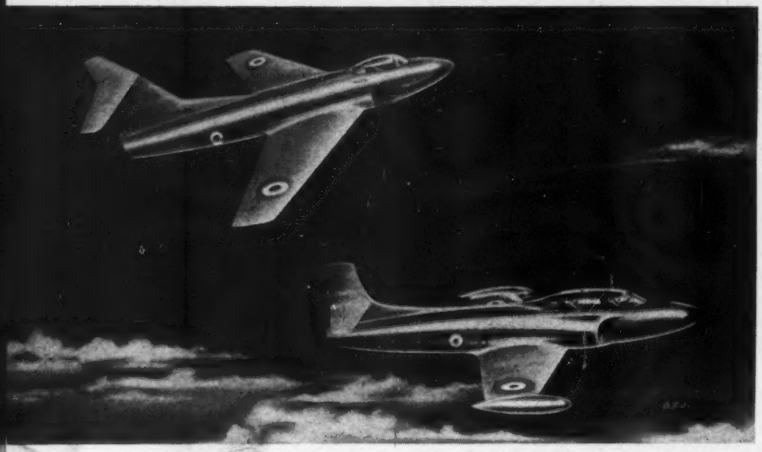
VISITING the Ryan factory recently, Dean Kundert, one of the personal pilots to the Nawab of Bhopal, told the story of a sensational landing carried out by a colleague, A. K. McLennan, an ex-R.A.F. Scot. The latter was about to land the Nawab's Navion, with the prince on board, when he discovered that the nose-wheel leg was failing to lock. Informed of





MIGHTY MICE: A salvo of 16 Mighty Mouse folding-fin air-to-air rocket projectiles photographed at the instant of leaving a North American F-86D over the Inyokern Ordnance Centre. A radio-controlled bomber is to be used as a target for them.

FREE BOOST: (Right) for emergency starting of J-47 turbojets in F-86As at advanced bases in Korea, this method of utilizing the jet blast of another F-86 is claimed to give initial turbine-rotation. More probably, it provides a warm intake stream to assist the work of the aircraft battery.



ITALIAN STYLES: A "Flight" artist's impressions of two forthcoming jet aircraft by Macchi and Fiat. The swept-wing single-seater fighter is the Macchi MB. 324 and the straight-wing tandem-seat trainer the Fiat G. 80.

the trouble—presumably by radio—Kundert drove a jeep on to the airfield, closed-in on the aircraft, and (so the story goes) held down the tail while standing in the jeep and driving with one hand.

P.S. to S. of S.

MR. T. C. G. JAMES has been appointed private secretary to the Secretary of State for Air, in succession to Mr. A. L. M. Cory, recently promoted.

Magnesium Control

THE Ministry of Supply has announced that control of the distribution and use of magnesium and its alloys will come into force on June 11th.

Supersonic Wallops

A PARTIAL lifting of security bans on news of the Wallops Island, Virginia, guided-missile range is reported to have revealed that test models have reached 30-mile altitudes and attained 3,000 m.p.h. Many models fly for only two minutes before plunging into the Atlantic.

TO TEST CF-100s: Peter R. Cope, who, as we recorded last week, is joining Avro Canada, Ltd., as a test pilot. He has held a similar post with Armstrong Whitworth—another member of the Hawker Siddeley Group—for the past 15 months.

Ambitions Achieved

WINNERS of Women's Junior Air Corps flying scholarships are Miss Beryl Harding of Ilford, Essex, and Miss Mavis Johnson of Croydon, Surrey. They will receive flying instruction at Southend and Redhill respectively.

Distinction for Airline Pilot

B.O.A.C. Senior Captain William L. Stewart, who has now been flying for some 20 years, has become the first airline pilot of Canadian nationality to be made an Associate Fellow of the Royal Aeronautical Society. Captain Stewart was one of the first pilots (if not the first) to complete 100 North Atlantic flights.

Comfort for Quadrupeds

A NEW "luxury" type of horse-box has been developed by Australian National Airways for the transport of racehorses in their Bristol Freighters. Measuring 5ft high by 7ft long, the boxes are open at both ends, so that a horse can be walked right through them, and five or six are carried at one time, according to the length of the journey.

De-icing for all

THE electro-thermal de-icing techniques developed during three years of research work by the Low-temperature Laboratory of the National Aeronautical Establishment at Ottawa are to be made available for use on commercial aircraft throughout the world. Mr. John L. Orr, head of the laboratory, made this announcement in a recent speech at the annual meeting of the Engineering Institute of Canada.

Courses at Harwell

PHYSICISTS and engineers who wish to obtain specialized knowledge of electronic instruments used in nuclear physics, radio chemistry, and work with radio isotopes, are being offered a course at the Atomic Energy Research Establishment, Harwell. The opening course, of one week's duration, starts on July 27th. Application should be made as soon as possible: details are obtainable from the Electronics Division, A.E.R.E., Harwell, Didcot, Berks.

IN BRIEF

THE chairman's report of British Insulated Callender's Cables, Ltd., to be presented at the annual general meeting on June 14, mentions the use of B.I.C.C. Cables in such notable aircraft as the Canberra, Comet and Viscount.

* * *

For the past three years public relations officer to Exide and associated companies, Mr. Richard Clements, B.Sc., leaves at the end of this month in order to devote his full time to his Hertfordshire farm.

* * *

H.F. heating equipment, electronic control apparatus, resistance-welding machines and television equipment are among the products on view at the new industrial-application showroom recently opened by Philips Electrical, Ltd., at Brixton.

* * *

W/C. R. H. Stocken has recently been appointed aeronautical consultant to J. Stone and Co. (Charlton), Ltd., a firm well known for airframe and engine castings in magnesium and aluminium alloys, and for copper-bearing alloy castings. W/C. Stocken also represents, in this country, the Société Industrielle Suisse of Neuhausen, and Interavia S.A. Publications of Geneva.

* * *

An agreement has been concluded between Smiths Aircraft Instruments, Ltd., Kelvin and Hughes, Ltd., and K.L.M., whereby K.L.M. are appointed official service and repair organization in the Netherlands for Smiths, Kelvin and Hughes instruments. Sales will continue in the hands of the existing Netherlands representatives, Technische Handelmij Hollinda N.V., whose headquarters are at Lange Vijverberg 13, The Hague.

TAKING IT HOME: W/C. Zahir Ahmed, C.F.I. of the North Indian Flying Club, left England recently to fly a new Auster Aiglet to Lahore, Pakistan, a distance of 5,000 miles; he planned to take ten days. An additional fuel tank has been installed in the rear of the cabin and, with an external auxiliary tank, makes the Aiglet's total capacity 43 gals.

The new Bristol 173 helicopter fitted with two Alvis Leonides engines

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EXERCISE OMBRELLE

Part II. With R.A.F. Units in Holland and Germany: The Closing Phase

Illustrated by "Flight" photographs

By H. F. KING, M.B.E.

THE first part of our account of Ombrelle—the Continental air exercise, in which some 500 fighters, bombers and military transports of six N.A.T.O. powers participated between May 23rd and 25th—embodied a report of happenings at the Netherlands airfields of Soesterburg and Volkel.

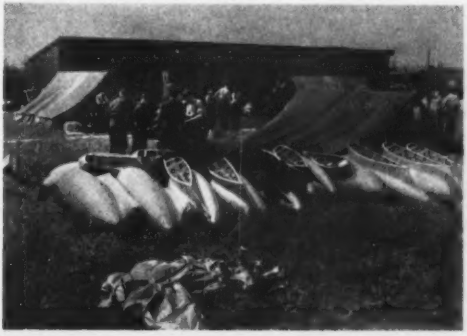
From Volkel we returned to Paris for the night, but relatively bright, and all too early, next morning (May 24th) were driving out to Le Bourget to board our R.A.F. Valetta for Eindhoven. Two sights we well remember: a single contrail hanging high over the city, and a Convair and a Viking on the Le Bourget tarmac displaying, as in admonishment, the names *Vintner* and *Pieter de Hooch*.

In circuiting Eindhoven we could see an extensive R.A.F. field hospital, the tents neatly laid out, with large red crosses to proclaim their function. The runway still bore the scars of last-war bombing. On the tarmac stood a handsome Dakota which, we learned on landing, had brought in Air Marshal Sir Thomas Williams, C.-in-C. British Air Forces of Occupation, Germany. At that time the Air Marshal was inspecting (in a locality which it is not permissible to disclose), the Group Headquarters and Operations Centre controlling the two wings of Vampire 5s operating from Soesterburg and Volkel. In the area were two Light Anti-Aircraft Wings of the R.A.F. Regiment and one of the Regiment's Ground-Defence formations.

At Eindhoven we heard more about the high standard of mobility demonstrated by R.A.F. formations during the exercise. From Germany, some 650 vehicles and 2,000 men had been transferred in 15 hours or so, which was especially gratifying as many of the drivers were graded Class B, and rarely drove more than a few miles out of camp. Technical difficulties had been few, though there was one bad accident in which civilians were involved. The Dutch police were helpfulness itself, providing as many men as were needed to lead and shepherd the convoys; and, of course, the Dutch station commanders in the area were most anxious to give every possible aid. An advance party had led the mass migration, the main body remaining in Germany until the Vampires had got away; for the return, the procedure was to be reversed.

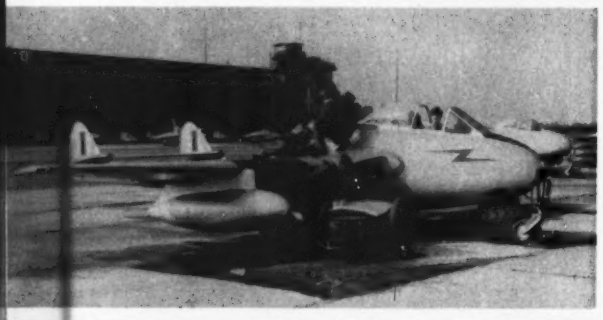
The British forces in Holland were under the command of A. Cdre. the Earl of Bandon, who, notwithstanding an influx of signals and other preoccupations, welcomed us personally and answered our questions with admirable forbearance. During the previous day (May 23rd) the Vampires under his command had flown 98 sorties and made 16 interceptions. They claimed 18 e/a. destroyed and 10 damaged. The Air Commodore confirmed that, during the early stages of the exercise, low-flying Vampires from B.A.F.O. were tackled by "Jim Crow" patrols and that the Vampires which (as we reported last week) intercepted three B-50s near Arnhem, were attacked in error by Dutch Meteors. A point worth mentioning is that although we had been assured at Soesterburg (the base of the intercepting Vampires) that the B-50s were escorted by F-84 Thunderjets, Group Operations avowed that the fighters were F-80 Shooting Stars, which seems improbable, for F-80s are no longer operational in Europe. This contradiction does, however, serve as a reminder that positive identification at high altitudes is a tricky business, especially so with many similar types of jet fighter now in operation.

It was heartening to learn that during May 23rd radar in the sector had been 100 per cent serviceable and that



Hundred-gallon drop-tanks for Vampire 5s (seen in the heading picture topping-up from a Dutch refueller) lie ready should the course of the exercise require them to be installed. Behind them armourers ply their trade. Below is a sight rarely seen in these days—an R.A.F. field hospital.

Having arrived from England by Valetta in torrential rain, visiting M.P.s are sustained with operational mugs of tea in the temporary officers' mess at Volkel.



EXERCISE OMBRELLE . . .

serviceability among the Vampires was reported as "good."

By now it was time that we paid a call on the opposition, so the Valetta flew us deep into Germany and set us down at a certain well-known B.A.F.O. station commanded by an even better-known officer in the person of G/C. E. M. Donaldson. If there is anyone in the Service better suited by experience and temperament to command a fighter/bomber wing his name does not readily occur to us. Add, as Wing Commander Flying, the one-and-only W/C. J. E. "Johnny" Johnson (newly returned from Korea), and three squadrons of the keenest pilots ever trained to operate impartially at 10ft or 40,000ft, and a most formidable combination results. Both the Group Captain and Wingco Flying met us, and, as it is not their custom to keep visitors waiting around on the tarmac, we were very soon discussing past and projected operations with them under the most agreeable circumstances in the mess.

Since the exercise had begun the Vampires had made low-level assaults on six targets—at Volkel (this was the zero-hour raid of which we had heard); Eindhoven; Soesterburg; the gates of a waterway at Ijmuiden; the airfield at Beauvechain; and a dump at Wittlich. On no occasion had they been intercepted before attaining their targets. Tactics, of course, varied to suit the weather and the nature of the target; but on a typical strike the Vampires would approach their objective at 20,000ft or higher (out of consideration for endurance) and then dive for the deck, where they would remain for the last 50 miles or so, perhaps pulling up to 3,000 or 4,000ft shortly before arrival, in order to verify the target and to determine the most advantageous direction for the final run-in. Having committed as much nuisance as possible they would head straight back to base, not pausing to fight if intercepted, in accordance with the conditions of the exercise.

But the conversation at the time of our visit always came round to the big show—the biggest to date—planned for that same evening (May 24th). The idea, as explained to us verbally (though not, we surmise, as specified on the operational order) was to beat something or other out of the somethings or other at Eindhoven. For this enterprise 24 Vampires had been detailed, and we were invited to attend the briefing of their pilots.

The met. officer gave warning of cloud in varying degrees and a tendency towards thunderstorms, though this should decrease in the target area. There had been one report of hail during the afternoon and the freezing level over Holland was 10,000ft, so the icing index would be high. W/C. Johnson, who was to lead the Wing (the Group Captain would fly as his No. 2), said he proposed to open the attack at 1745 zebra. His own formation would run in from the north-west; W/C. Cox's from a more westerly point, and S/L. Strudwick's from almost due west. The Wing Commander gave a reminder that, according to the conditions of the exercise, there was to be no instrument flying below 31,000ft. R/T. silence would be preserved insofar as possible, but under no circumstances was the safety of the Wing to be jeopardized. W/C. Johnson said he had no intention of "forcing on with 24 aircraft through cu. nim." The Wing would be airborne for 1 hr 27 min and would not form up after the attack, in order to conserve fuel. Reconnaissance photographs of the target, secured by a Meteor F.R.9 or P.R.10, were displayed.

In the cool of the evening we drove to the head of the runway to see the Vampires set out. A Lincoln droned

THE STORY OF A STRIKE

The sequence of "Flight" photographs on these two pages illustrates the actual preparations for, and mounting of, a raid by Vampire F.B.5s of a B.A.F.O. Wing. Uppermost on this page is a tarmac scene showing four of the Vampires, marked by black bands to signify their "enemy" role, with beyond them, a Meteor 7 trainer and the Valetta in which "Flight's" representatives made their tour. Next, a ground crew is making final preparations and then follows the scene at briefing, with W/C. "Johnny" Johnson pin-pointing the target at Eindhoven. G/C. E. M. Donaldson, the station commander, who flew as the wing commander's "No. 2", is facing inwards from the end of the first table, by the window.

unhurriedly above the airfield, and when it had passed we heard only a cuckoo in the fringing woods. Then the ear caught the whine of a compressor, and gradually, as the jets started successively, a complete diapason of Goblin-sounds destroyed the pastoral stillness. The first pair of Vampires moved out of line and taxied swiftly round the perimeter track; then others, until most of the two dozen were simultaneously on the move in Indian file. There was no delay: the leading pair turned on to the runway, opened up and went screaming past. Within a few minutes the entire Wing was setting course over the control tower, and we were lamenting that we were not along with them in the Meteor 7, which, alone with our Valetta, now remained on what a few minutes before had been a crowded tarmac.

Beyond the fact that the strike had been successful we heard no more of this zestful operation.

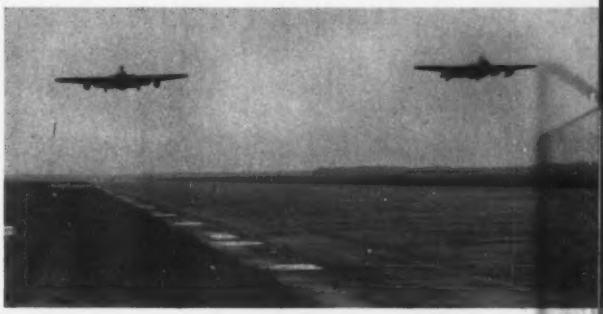
We returned to Paris and gathered that during the day heavy bombers had resumed their attacks. Superfortresses concentrated on a few important targets and were followed by formations of Wellingtons and Mosquitoes. Some interceptions were effected before the enemy reached his objectives, others over the targets. Small formations of low-flying U.S.A.F. Thunderjets and R.A.F. Vampires raided airfields and other targets but the percentage of these raids intercepted was higher than during the first phase. Enemy effort was generally on a small scale, as forces were being held in reserve for the next phase, commencing at 1800 hr on the evening of the 24th.

We learned that in addition to the squadron of B.A.F.O. Vampires which was being switched from Volkel to Luxeuil, a Belgian Meteor squadron was moving from Beauvechain to Gilze Rijen and a Dutch squadron, similarly equipped, from Gilze Rijen to Beauvechain.

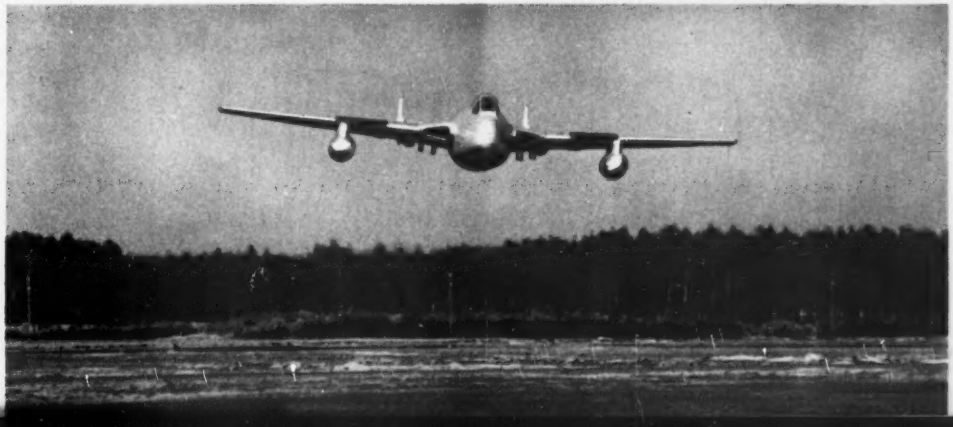
From Versailles on May 25th came news of the previous night's activity. Early in the evening a force of about 100 aircraft, comprising Superfortresses and Packets of the U.S.A.F. and R.A.F. Lincolns and Washingtons, had resumed operations. Most of their attacks were against important centres in Western Europe and a very high percentage had been identified long before the targets were reached. A few raids were intercepted by day fighters late in the evening and after that, in spite of difficult weather, Belgian Mosquito night fighters engaged a considerable number of bombers over the Low Countries. In this connection we learned that the hand-over of the night fighters from sector to sector—that is, from one country's organization to another, within the overall defence system—was effected in a very satisfactory manner. One Lincoln, in difficulties with engine trouble was guided back to base.

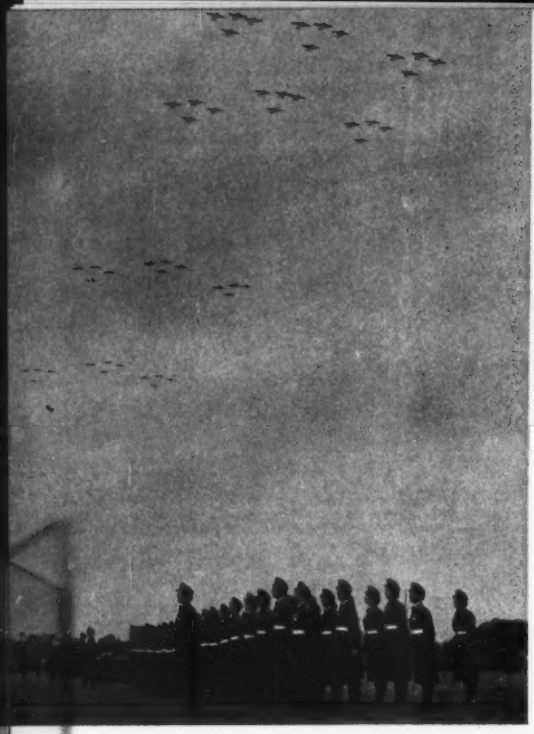
The third and final phase of the exercise opened at mid-day on May 25th under less favourable conditions than had obtained for the preceding phases. Raiding forces operated on a smaller scale than during the first two days, but Superfortresses, heavily escorted by Thunderjets, made high-altitude attacks on a number of centres in the east of the exercise area. R.A.F. Wellingtons and a small Mosquito force attempted deep-penetration raids. All raids were identified and many combats resulted, though the defenders were heavily handicapped by weather. On the other hand, the weather also minimized the efforts of the Thunderjets and Vampires in their low-level harassing assaults.

When the exercise was over General Norstad spoke with warm appreciation of the alertness and keenness of every nationality concerned. "With that spirit," he said, "with the programme for increases in strength of men and equipment, and even with the strength we have now, we expect to be able to meet the requirements of our task."



The "strike" sequence continues (foot of page 670) with a close-up of G/C. Donaldson (centre) with W/C. Johnson (left) and W/C. Cox. The group captain, it is observed, totes a cushion as well as his parachute. Next, a section of Vampires gets under way; then, observed by watchers atop the control tower, 7 of the formation of 24 fighter/bombers are seen setting course. Finally, an intimate "over-target" impression of a Vampire, boring in for the attack. As will be seen, only wing tanks and rockets rails are fitted, but the four 20 mm guns are loaded. In place of the tanks, two 1,000-lb bombs or napalm tanks can be slung. Another alternative load is two 1,000 lb bombs and eight 60 lb rocket projectiles.



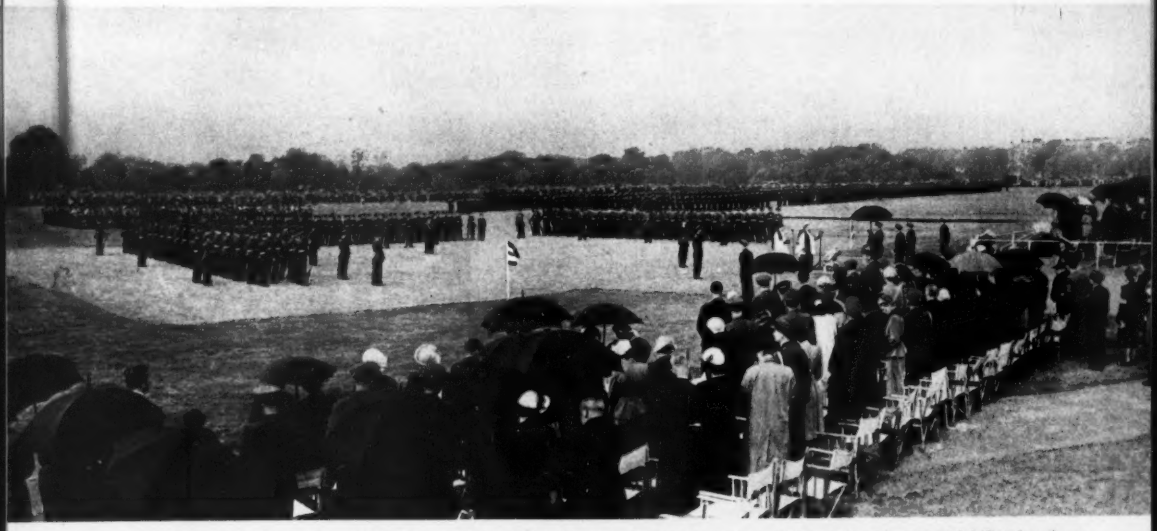


(Above) Lighter moment: Princess Elizabeth enjoys a jest—probably about the weather—with the C.A.S., Marshal of the Royal Air Force Sir John Slessor (in foreground).

(Left) The depressing grey ceiling was just high enough to permit the fly-past, in perfect formation, by Fighter Command Vampires (leader, W/C. A. C. Rawlinson) and Meteors (leaders, W/C. J. M. Thompson, S/L. A. G. Conway and W/C. W. Pitt-Brown). The W.R.A.F. are on parade with their new head-dress.

Presentation of the King's Colour

Princess Elizabeth Deputizes for the King : Pictures of the Notable Ceremony of May 26th



A panorama of the parade. It was generally agreed that it reflected great credit on the organizers of the complicated ceremonial drill and on those who executed it. The only lapse was that of the weather: sunshine—though it might have meant discomfort for the ranks—would have added much to the brilliance of the scene. This photograph, taken during the consecration service, shows the escort squadron in "hollow square."

(Above, left) The Prime Minister, Mr. Clement Attlee, arrives in company with Mr. Arthur Henderson, Secretary of State for Air.

(Above, right) The Rev. Canon L. Wright, K.H.C., Chaplain-in-Chief of the R.A.F., consecrates the Colour. Chaplains in attendance were the Rev. F. D. Morley, B.D., K.H.C., and the Rev. C. B. Verity, M.A.

(Centre) A much-loved figure arrives: Her Majesty Queen Mary, celebrating her eighty-fourth birthday on this day. She is being greeted by Mr. Arthur Henderson.

(Extreme right) Air Chief Marshal Sir Hugh Saunders, C-in-C. H.Q. Air Forces Western Europe. Accompanying him is Lady Saunders.

Her Majesty the Queen and H.R.H. Princess Elizabeth arrive—and appear to be making little use of the forest of umbrellas offered by the A.D.C.'s.

Their Royal Highnesses the Duke and Duchess of Gloucester are greeted on arrival by Mr. Aidan Crawley, Under-Secretary of State for Air.

Marshal of the Royal Air Force Lord Tedder and Lady Tedder make their way to the stand.

THE SUPERB "660" —— *A Flight*

IT is rarely that we are per
impression, but this one, ab
we feel, a justifiable exception
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they hardly convey the fineness
appearance in flight with its r
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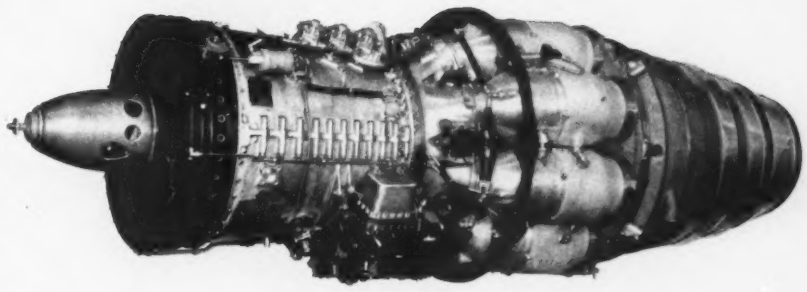
Edwards, M.B.E., chief designer,
J. Summers, O.B.E., chief test
who, with Mr. G. R. Bryce, is
honour is also accorded the Rolls-
are buried in the inboard wing
the finest bomber in the air today.



In the Way of THE VIKINGS

Part II: Impressions of S.A.S. in Action

By E. A. G. RUMBELOW

An imposing view of the main terminal building and control tower at Bromma (Stockholm), headquarters of the re-organized S.A.S.

IN the first part of this article, published last week, the author—a member of our staff—reviewed the origins and history of the various elements from which the Scandinavian Airlines System has been formed. In this second and concluding instalment he gives his impressions of current equipment, bases and operating techniques: the picture is one of modern, efficient methods: applied in a pleasant and unassuming manner.

IF, as has been said, Scandinavia owes much to aviation, a recent tour of the main airports in the three countries leads me to reflect that the converse of that axiom is also true—if not equally so, then at least to a perceptible degree. My favourable impressions began with the flight from London, this, once we had escaped from the rather depressing atmosphere of the passenger-departure rooms at London Airport, proved to be as pleasant a ride in a DC-4 as I have experienced.

Olav Viking bore us swiftly and smoothly eastward, out of the dull grey mists which blanketed the English coast and into the translucent sunlight over the Low Countries. The canal-webbed coast of Holland provides a vista of constant interest to the airline traveller, and I began to feel sorry for the passengers in the inner seats of the DC-4, whose windows do not lend themselves to landscape-gazing. Nevertheless, the type is still very popular with passengers and crews alike.

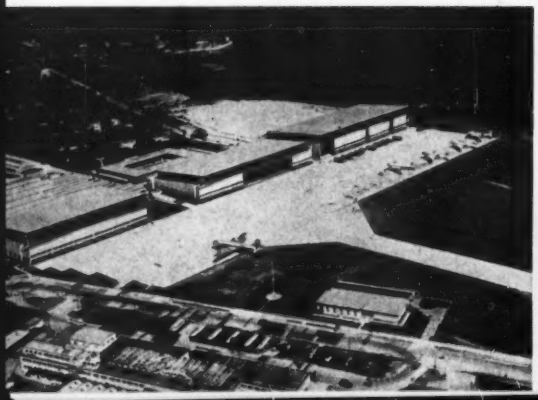
On arrival at Copenhagen's Kastrup airport I noticed particularly the ease and expedition with which passengers were shepherded through Customs and Immigration formalities. Obviously the authorities there are less suspicious of foreign visitors than are their British counterparts.

Having quickly proved to my own satisfaction that Denmark is not referred to as the "smiling country" without justification, I went, next morning, to look round the terminal and maintenance hangars at Kastrup. Only eight kilometres from Copenhagen, it is a busy airport which, despite all the bustle of high-frequency traffic, manages to retain an air of efficient calm and serenity. Perhaps the fresh sea breezes have something to do with this, for the airport is ideally situated on the eastern coast of a small island. It has four good runways and a spacious terminal building, and is equipped with all essential aids with the exception of G.C.A. It is the base of the former D.D.L. which, under the newly revised agreement, has become an integral part of S.A.S. and is referred to now as the Danish Division.

Certainly the outstanding feature of Kastrup, however, is the highly efficient maintenance organization which has been built up there; this is now comfortably housed in three very fine hangars—one of which, incidentally, was designed to take the once-ordered Stratocruisers that finally found their home with B.O.A.C. Accommodation consists of a maintenance hangar (complete with workshops) and two servicing hangars, available floor space being 124,861 sq ft, 61,355 sq ft and 83,420 sq ft respectively. Broadly, the workshops are laid out and equipped along American lines and have been designed particularly to eliminate time-consuming movement between the various sections.

Interior decoration is attractive: the use of pastel shades where

(Left) Aerial aspect of the new maintenance base at Kastrup. (Right) A good deal of contract work is undertaken there; the DC-4 comes from Siam.



The National Gallery designed by William Wilkins was built in 1832-38. The approach to the building from Trafalgar Square is up an imposing flight of stone steps to a portico, the columns of which originally formed part of the old Carlton House.

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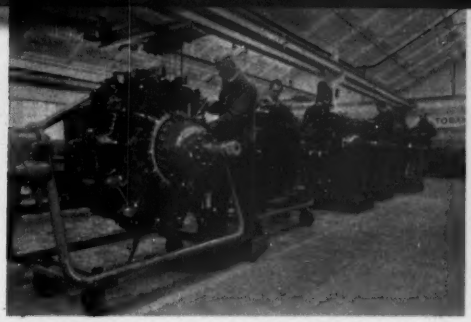


Pratt and Whitney engines in an advanced stage of re-assembly.

Special protective clothing is worn by workers re-sealing fuel tanks.

IN THE WAY OF THE VIKINGS . . .

possible has given a light and airy appearance suggestive of some of the pavilions at Britain's South Bank Exhibition. Working conditions for personnel are ideal.

A most remarkable feature of the workshops at Kastrup is their extreme neatness. In a two-hour tour it was hard to detect a single item of equipment which was not exactly in place, while even in the engine dismantling shop one literally had to search hard to find any sort of dirt. I have seen many aircraft repair and servicing organizations, but quite definitely none which caused such an outstanding impression of efficiency as did this one.

Work at Kastrup consists mainly of S.A.S. DC-4 overhauls and line maintenance, although overhaul work for other operators is also being undertaken. Application has been made for C.A.A. approval, and other operators of Douglas aircraft will be able to save themselves a considerable amount of dollars by using D.D.L.'s overhaul facilities. Several DC-4s were going through the shops on 8,000-hr overhauls during which, in addition to routine inspection, fuel tanks were being taken out and re-sealed. The process involves spraying their interiors with a caustic solvent and then flushing them with a high-pressure water jet. A sealing compound is later applied by hand. This feature alone can lead to substantial economies for European operators, as, previously, tank sealing was only carried out in the Douglas factory.

The S.A.S. aircraft docks are also worthy of special mention. Built in Scandinavia, they are arranged to give "walk-round" access to any point of the aircraft. Located at the nose of the machine is a fully-equipped office fitted with a "chatterbox" telephone link to work-stations in the dock so that the overseer is in constant communication with his foremen.

Although the S.A.S. DC-4s were originally fitted out to accommodate 40 passengers, cabins are being elongated, during 8,000-hr inspections, to make room for 44. The engine overhaul shops are to be found at the rear of the workshops, together with installations for overhaul and testing of all hydraulic system accessories. After dismantling, engine parts are placed on trays and removed to the cleaning department, before coming under the wary eyes of the inspectors. Overhaul, repair, re-assembly and engine testing follow in natural sequence and at the end of the line emerge power units whose condition and finish are quite indistinguishable from new.

There are also fully equipped and air-conditioned instrument and radio shops with bench installations for testing radio, compasses, and I.L.S. and other aids. Kastrup also maintains its own aircraft engineers' school, which ensures an adequate flow of skilled labour.

The airfield itself could hardly be better located from the operational viewpoint. The approaches are unobstructed and Kastrup is nearly always "open." Put into service in 1925, it did not reach its present proportions until 1946; expansion involved the reclamation of 15 acres of land from the sea by building a 930 yd dam in the Sound and filling in the enclosed area with sand. Traffic at Kastrup is increasing rapidly and I understand that plans are being considered to extend the runway pattern to provide for two take-offs and one landing simultaneously in the direction of the prevailing wind.

At a midday *smorrebrod* session (the Danes normally partake of these interesting sandwich concoctions at lunch-time) I met the general manager of the Norwegian Region, Mr. Kalm, and several visiting directors. Touching lightly on the subject of re-equipment, one gathered that S.A.S. is firmly attached to the Douglas strain of transports, having had exceptionally good service from them since the beginning of the last war. There is a certain amount of interest in the Avon-powered Comet, but no other British type now in existence, with one possible exception, seems to awake any more than academic enthusiasm. DC-6Bs have recently been ordered and, for heavy transports at least, S.A.S. will probably stick to Douglas for some time to come. Medium-stage operations apparently pose more of a problem, as the Scandia, although in

The laboratory-like instrument-repair shop at Kastrup is air-conditioned.

itself a fine little aircraft, is not really large enough to be economical. The preponderant factor in reaching the eventual decision as to what shall replace DC-3s may well be influenced by the fact that S.A.S. has already laid down a very well-equipped Pratt and Whitney overhaul organization.

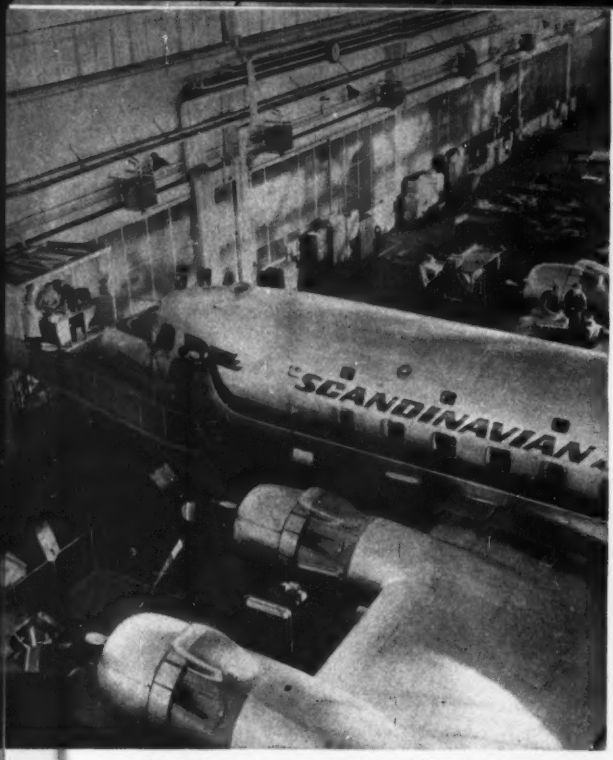
Before leaving Kastrup on the next part of my tour I was able to participate in the despatching of a DC-6 on S.A.S.'s longest route, from Stockholm to Tokyo; the occasion was well be-flagged and celebrated in fitting style.

The Copenhagen-Stockholm leg of my tour was made at night in a DC-6, an aircraft very much to my liking. With its two cabins, it is exceptionally roomy, and the enlarged cabin-windows are a great improvement on those of the DC-4. In the rear seats and the toilet, however, the "tailwagging" tendency becomes rather unpleasant in turbulent weather.

The night arrival at Bromma was an interesting experience, for in the clear Scandinavian air the myriad sparkling lights of Stockholm provide a fascinating panorama.

At the airport next day I visited the new headquarters building from which the entire operations of S.A.S. are now to be controlled. The administrative structure looks well-balanced and economical in operation. Under the president, Per A. Norlin, there are two executive vice-presidents, at present Per M. Backe and Vigor Rasmussen, who control respectively six vice-

The three maintenance hangars at Bromma, framed beneath a DC-6.



The self-contained office, as built into each of the aircraft docks, can be seen facing the nose of this DC-6 undergoing overhaul at Bromma.

Control-desk of the engine test-house at the Bromma maintenance base.

presidents (economics, finance, traffic, sales, operations, and external affairs) and five advisory bureaux (public relations, legal, secretariat, buildings, and insurance).

It should be noted particularly that S.A.S. has even dispensed with separate technical and operations controllers, both aspects now being under the control of the vice-president operations, an arrangement which is undoubtedly desirable. The vice-president operations, incidentally, is Mr. K. Hagerup-Svendsen, a former member of the Free Norwegian Air Force; he later proved an interesting travelling companion on my night flight to Oslo.

A visit to the statistical department at the new H.Q. showed something of the way in which S.A.S. is growing. Revenue passenger-kilometres flown last year were 21 per cent higher than the previous year and, with a total revenue load-factor of 55.8 per cent, the total of revenue ton-kilometres performed was 30 per cent better than in 1949.

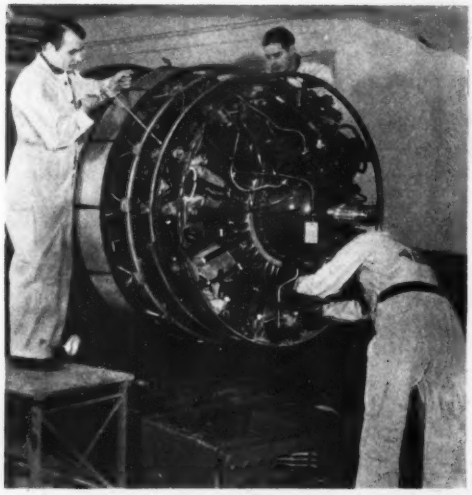
Bromma Airport, the base of the new S.A.S. Swedish Region or Division (formerly A.B.A.) was built in 1936. It has four runways, the approaches to which are not all good. The maximum capacity of the airport is about 12 aircraft on simultaneous dispatch and 15 on the tarmac; ideally, therefore, Stockholm requires a further intercontinental airport which lends itself more easily to expansion than does Bromma. The airfield is at present equipped with an M/F. range, radio beacons and I.L.S. I learned during a chat with the Swedish Minister of Civil Aviation that the airline is most anxious to install G.C.A. as soon as possible, but that the money for this project is rather hard to find at the moment. While I was at Bromma the Minister departed in a Bell helicopter to get first-hand knowledge of the approach problems on one of the runways.

The Swedish maintenance base, comprising three large hangars (one of them is the second largest in Europe and houses ten DC-6s and two DC-3s) is devoted to the overhaul and repair of DC-6s and a small number of A.B.A.'s DC-3s. While not as new as the base at Kastrup, it still gave the impression of being every bit as efficient. One outstanding feature was the locally designed type of mobile engine platforms which are being used (see the adjacent photograph); these platforms eventually form part of the test-bed itself and obviously save many man-hours. A C.A.A.-approved Link Training School is also in operation in which pilots can actually be checked out for Atlantic schedules without training in the United States.

The flight to my next port of call, Fornebu (Oslo) was made in a Saab Scandia. It seemed a pleasant little aircraft from the passenger's viewpoint, and it is also very popular with the pilots, who appreciate its excellent single-engine performance and first-class cockpit layout. The unmodified exhaust system, which at night can prove rather disconcerting to the uninitiated passenger by belching voluminous flames, needs some attention. I understand, also, that a tailplane modification has to be made before the maximum speed can be pushed up above its present temporary limit of 200 m.p.h. The 24-seat version is very comfortable, but the 32-seater is definitely a little crowded; the type is also unpressurized. The company hopes to be able to certify the Scandia for 1,000 hr between overhauls after 1½ years of operation and, although the production schedule is uncertain at the moment, I think S.A.S. would like to add to its present fleet of six.

At Fornebu I became aware of the fact that, while still an integral and fully co-operating part of S.A.S., the Norwegian Division (formerly D.N.L.) has retained its individuality to a greater extent than have the other two partners. This is no doubt due to the fact that Norway, with its enormous, straggling coastline, and relatively tiny population (3,000,000 only) has its own peculiar operating problems. Flying over routes such as that from Oslo to Tromsö (1,500 km and the longest route in Europe) for example, requires something of the pioneering spirit.

Who, then, could be better equipped to lead Norwegian operations than Major-General Hjalmar Riiser-Larsen? It was he who, as a lieutenant, acted as pilot to Amundsen on the great Arctic flight of 1925, when Amundsen and Ellsworth crossed the polar regions in two Dornier Wal flying-boats with Rolls-Royce Eagle engines. General Riiser-Larsen, who has also held the rank



(Above) *This time-saving mobile engine platform has merely to be connected to the controls and pressure lines of the test-house.*

(Below) *The Swedish Director of Civil Aviation leaves by helicopter to inspect the approaches to Bromma.*

19e SALON INTERNATIONAL
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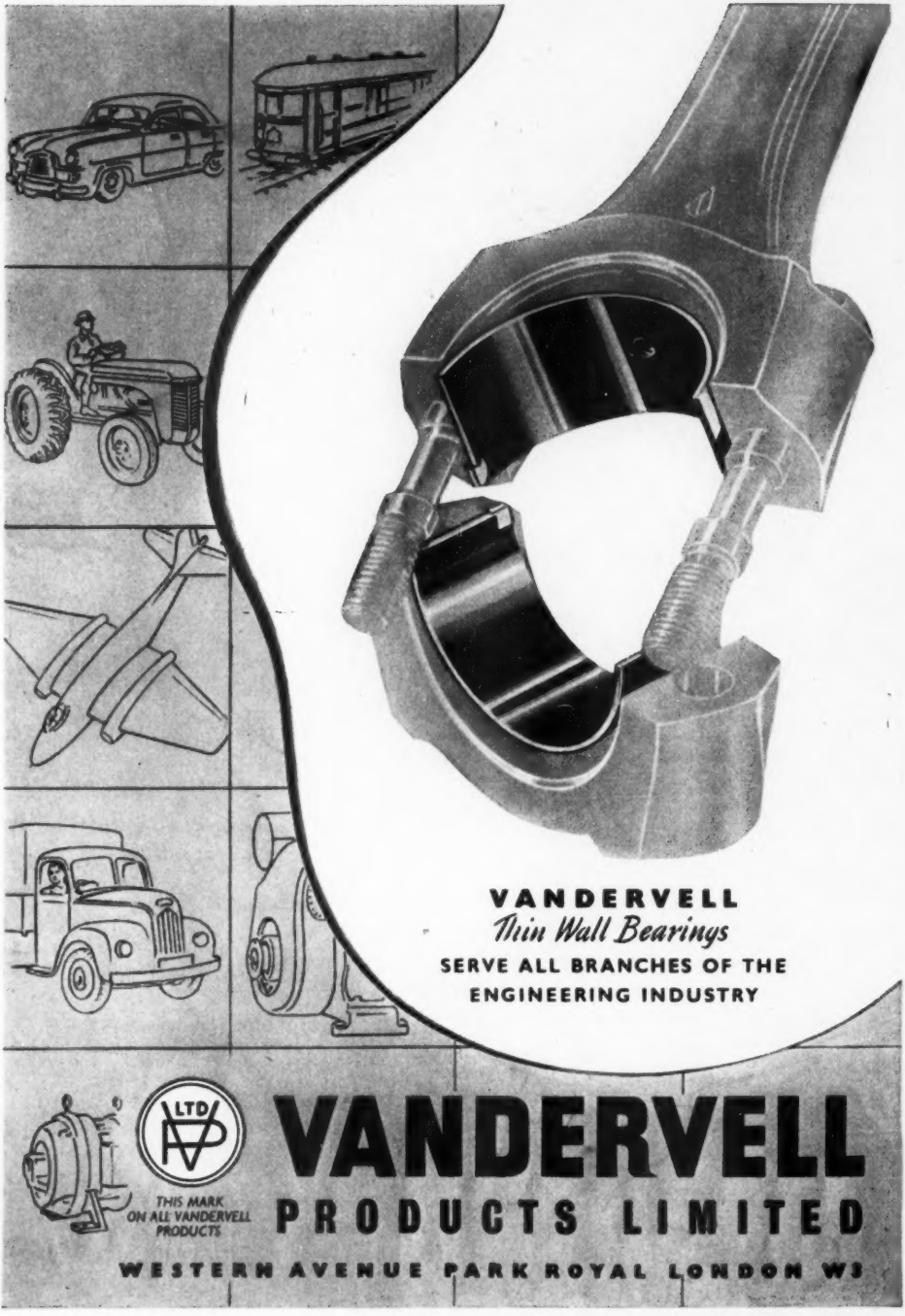
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Personalities in S.A.S.: (Above, left) Per A. Norlin, president; (above, right) Maj. Gen. Riiser-Larsen, in charge of the Norwegian Region; (left) Per M. Hansson, chairman of the S.A.S. working committee for 1951.

Apart from S.A.S. there are also two other fairly large operators at Oslo—the Braathens S.A.F.E. long-distance charter organization, using DC-4s, and Fren Olsen Air Transport, Ltd., whose DC-3s carry large quantities of freight and mail to outlying districts. Both companies make use of S.A.S. overhaul facilities.

The last leg of my Scandinavian tour, from Oslo to Kastrup *via* Gothenburg by Scandia, proved an interesting flight over very unusual scenery. Hundreds of rocky islets with wooded slopes and sandy coves, set in a bizarre pattern of fascinating complexity, passed in endless procession beneath our wings. Flying over Norway in good visibility is sheer delight for the passenger and, I suspect, never palls on the crews.

After a brief call at Gothenburg, we set course for Kastrup and the tour, regrettably, was almost over.

Throughout, there had been a continual impression not only of S.A.S.'s high standards of efficiency and good "airlineship," but also of that subtle extra touch of friendliness shown towards all passengers by all personnel. It was the sort of thing which, coupled with the undoubtedly correct policy reflected in the newly revised merger agreement, will constitute formidable competition for other European operators.

IN THE WAY OF THE VIKINGS . . .

of Rear-Admiral in the Norwegian Navy, was chief pilot of Norway's first airline, established in 1918. One felt it an honour indeed to meet this famous explorer.

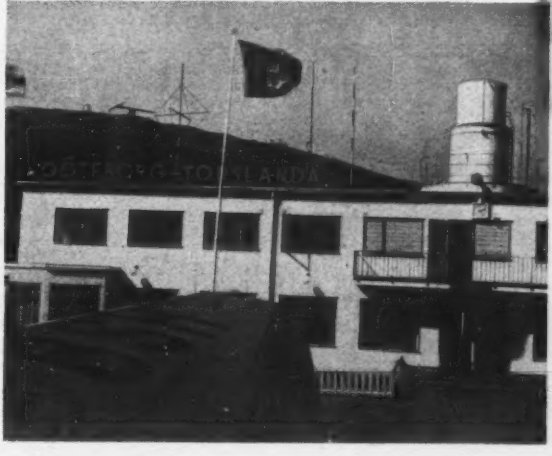
About half of Norway lies within the Arctic Circle, and therefore imposes some unusual operating conditions over a large proportion of the routes. The coastal services up to Tromsö are flown in summer with two Short Sandringham flying-boats; Ju 52s on floats complete the service from Tromsö to Kirkenes and other northerly points. D.N.L., incidentally, has been using Ju 52s since 1935, the two now in service being ex-Luftwaffe.

Many of the services are essential mail and supply links and, in order to continue operating them, a large subsidy has to be provided by the Government. Imported vegetables form a large proportion of the freight loads, but the Sandringhams are also used on the popular "Midnight Sun" tourist flights, which must certainly offer some of the most beautiful scenic attractions in the world. In the interests of economy, however, the Sandringhams will probably be withdrawn as soon as the new airstrip at the northern town of Bødu is completed.

Oslo itself, tucked away in the less mountainous south of Norway, is, at the moment, served by two airports. Fornebu deals with all medium traffic, but any aircraft larger than DC-4s must go to Gardermoenen, some 25 miles farther north. The eventual plan, however, is to extend the runways at Fornebu so that all traffic may be concentrated there. It is hoped to increase the runways from 1,300 metres to 1,600 metres in length by next year.

Fornebu has S.A.B. and I.L.S., but, again, it seems that pilots are keen to get G.C.A. installed. In Norway's case this may be difficult, not only for financial reasons, but also because of a severe shortage of radar technicians.

For navigation in this vast country there is almost complete coverage by M/F. beacons, but, looking ahead, the Norwegians are very much in favour of the idea of Decca, mainly because of its useful shipping application. The maintenance organization at Fornebu deals with most of S.A.S.'s hard-worked DC-3s, and also with the Scandias. There are two hangars (unfortunately situated on different sides of the field) and a brief tour showed quite convincingly that maintenance and overhaul work there is up to the same high standard as that at Bromma and Kastrup.



(Above) A view of the main terminal at Fornebu, Oslo, the new home of the S.A.S. Scandia fleet. (Below) The terminal building at Gothenburg, as seen from the writer's arriving Scandia.

MORE THAN MEETS the EYE

Knowledge and Craftsmanship in the Specialized Production of Aircraft-tubing Assemblies

An exacting job: Dynafocal mounting for Centaurus in Ambassadors.

IN our contacts with what, for want of a better term, is often known as "the ancillary aircraft-industry" we never cease to marvel at the vast store of specialized knowledge and skill that lies behind the manufacture of the average material or component, whether it be a complicated or a relatively simple one. Though the same might be said of almost any branch of industry, its truth in application to aircraft manufacture is particularly obvious to anyone who knows anything of the subject.

The aircraft constructor designs his product and then calls upon the ancillary industry for the materials and bits and pieces from which to fashion it. Sometimes his requirements are simple; more often they are difficult; occasionally they verge on the impossible. But whatever he wants there are people who can provide it, and it is a measure of his long-established confidence in such specialists that he is almost always happy to "leave it to them": provided its performance meets the required standards, official or otherwise, then he is content. Whereas from long business association he is apt to take this background of know-how for granted, to the detached observer—such as ourselves—it is, as we have said, a constant source of wonder.

Such thoughts passed through our minds during a recent visit to the Tyseley, Birmingham, works of the Reynolds Tube Co., Ltd. As most readers associated with the industry will be aware, this old-established concern is a member of the Tube Investments Ltd., group. Until 1947, its aircraft products included both steel-tube work and light-alloy tubing and extrusions; then the light-alloy side of the business was taken under the control of the light-alloy division of the T.I. Group and Reynolds were left to specialize in steel, though a modicum of alloy manipulation is still performed.

Engine mountings are the principal aircraft product, though, as will presently appear, there are a number of other items, not all of which (except in quality) are in a directly comparable category. Mountings recently delivered and/or in current production include the five varied types listed at the top of the next column, designed for in-line and radial engines and for turboprops:—

Rolls-Royce Merlin 35 mounting for Boulton Paul Balliol 2.
Bristol Centaurus Dynafocal ring for Airspeed Ambassador.
Various Bristol Hercules rings.
Armstrong Siddeley Mamba mounting for Armstrong Whitworth Apollo.
Mamba-Dakota experimental-installation mounting.

In addition, Merlin mountings for the Lincoln are still in production.

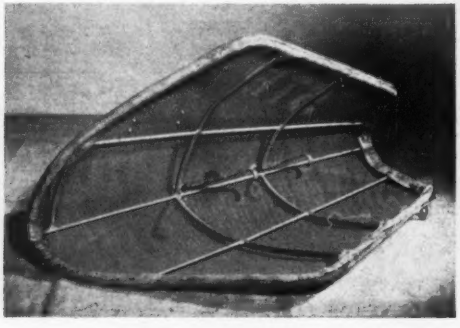
The seamless steel tubing from which these assemblies are fabricated is manufactured "on the premises" from hollows or blooms; the various stages in the process—cold drawing, annealing, pickling and so forth—are rather grimly spectacular and quite fascinating to watch. Actual fabrication begins with cutting to length and then bending—a process which, in view of the complex nature of the finished assembly, and the close limits specified, calls for considerable craftsmanship. Though power-operated forming-rolls are used they are in no sense automatic, and the precision of the job is largely dependent upon the operator. Cerrobend and similar-type fillers are used to prevent kinking.

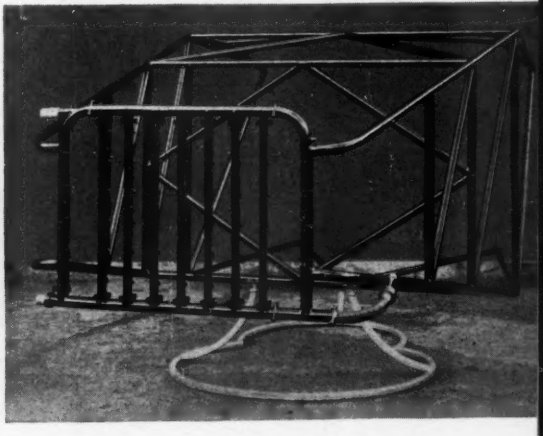
Personal skill is again very evident in the second stage of fabrication, that of welding. Though elaborate jigs—built in the works—are used for this purpose, the risk of distortion occurring between closely adjacent welds has to be constantly kept in mind. Fabrication of the 31- 36in-diameter Dynafocal mounting, with its 18 accurately ground faces radially disposed round the rectangular-cross-section (3in x 2in) ring, is particularly satisfying to watch. Typical limits on this job are 0.005in for hole-centre locations and 0.0005in for hole diameters.

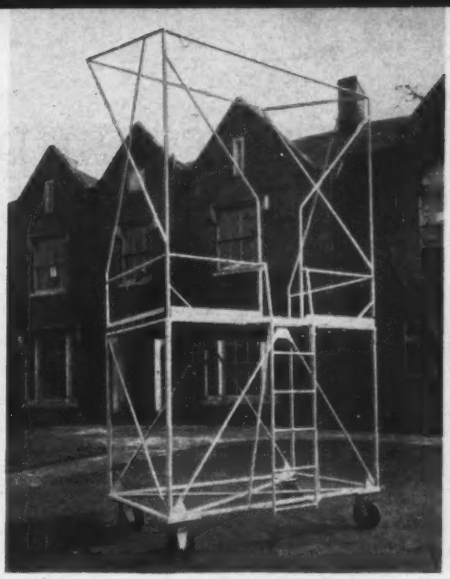
Calling for less precision was another item which we saw going through in fairly large batches—an air-intake guard, assembled from steel tube and wire mesh, for the D.H. Vampire.

Nobody needs reminding that aircraft research and development frequently call for special apparatus, often of complex design. Frequently it is made in the aircraft factory or experimental establishment itself; but sometimes—and especially if it is to

Respective examples of "batch" and "one off" production of aircraft components by Reynolds: (Right) Spray grid for ice tests on Mambas installed in Lancaster flying test-bed. (Below) Vampire air-intake guard; the outer frame is padded to prevent damage to the leading edge.







(Above) Allied with tube work, yet representing a different technique of fabrication, are pressure vessels, two examples of which are seen above.

(Right) A tubular engine-maintenance staging built to the order of Trans-Canada Airlines. In the background is part of the 650-year-old mansion, Hay Hall, which serves nobly as Reynolds' office block.

be used in flight-test work—its construction becomes something of a specialist job. Reynolds will tackle such "one off" orders, and can also assist in the detail design if the broad requirements are specified. A good example is the assembly illustrated opposite—perhaps a little reminiscent of a Victorian bedstead minus the brass knobs, but actually made for the "Mamba-Lanc" flying test-bed, and used to spray water into the intakes during icing tests. Six spray-nozzles are mounted on each of seven vertical tubes; overall dimensions are approximately 13ft x 5ft 6in and total weight about 150 lb. Clearly, in view of the probably serious results if any part were to come adrift, a device of this kind cannot be just "thrown together".

Another category of product is the engine-servicing staging also shown here; a number of these were made by Reynolds to the order of Trans-Canada Airlines. The principal components are bolted-up, so that the structure can easily be broken-down for transport, and some of the stagings have also been supplied with canopy-rails to provide protection for ground staffs when engines are being serviced in the open.

In a different category again—though still one that is basically "tubular"—are pressure vessels, and the Reynolds Company makes these in considerable quantity for the aircraft industry. Oxygen, air and other bottles are manufactured, in both cylindrical and spherical forms, for pressures of up to 3,000 lb/sq in. The making of such a vessel is another process that is fascinating to watch. A cylindrical bottle begins as a plain, fairly thick disc of aluminium alloy. This blank is first converted into a spherical-based cup by hot forming in a hydraulic press. It is then cold-drawn to approximate diameter and wall thickness, trimmed to length, chemically cleaned, and "necked" again in a press, after which it is heat-treated, screwed, anodized and pressure-tested.

Two examples of this work are illustrated here. One is a cylinder used in the Dowty hydraulic installation in the Gloster Meteor; the other is an oil-water trap as employed in the high-pressure air systems made by the Hymatic Engineering Co., Ltd.

To return, finally, to tubes pure and simple—or perhaps not quite so simple. Fifty-six years ago the Reynolds business (which even then had been in existence over fifty years) turned its attention to seamless steel tubing, and in 1897 Alfred Reynolds, Jnr., patented something that was to revolutionize cycle-manufacture—the butted tube. It is still a Reynolds speciality to-day.

Though the term "butted tube" may suggest some kind of joint with a brazed-in sleeve it has, in fact, little direct connection with such assemblies. It is associated with the taper-gauge tube (i.e., a tube having a constant outside diameter but an increasing wall-thickness) but in this case provides a comparatively sudden increase in wall-thickness at the end or at any other point where extra material is required for joint-making purposes.

So far as we are aware, neither taper-gauge nor butted tubes are being employed on any large scale in aircraft construction, in spite of their apparent advantages and their practical use by at least one constructor: in the early years of the war, taper-gauge tubes made by Reynolds were extensively used in the manufacture of the Blackburn Bothas, and the method formed the subject of articles in our sister journal *Aircraft Production*.*

To anyone with some mechanical knowledge but no acquaintance with this particular product there is a suggestion of the impossible about making a tube with a constant outside diameter yet a wall-thickness that increases at both ends.

In reality, the process—as we saw at Tyseley—is almost absurdly simple. The material enters the shop as a normal tube of constant inside and outside wall-thickness; it is then fitted on to an accurately ground mandrel which tapers-off at each end, and cold-drawn by dies of such a diameter that, while the exterior diameter of the tube is reduced to a constant degree over its whole length, the wall-thickness is built-up over the tapered areas of the mandrel (or, in other words, so that the inside diameter decreases). The mandrel is now, of course, firmly imprisoned; but it is released in a matter of a few seconds by a "reeling", i.e., by passing the tube between two rolls which expand the metal sufficiently to allow the mandrel to be withdrawn.

The variations in wall-thicknesses obtainable are very considerable, and can be produced over long or short lengths, depending upon the type of machine or drawbench used.

**November, 1941, and January, 1942.*

NEW CABIN PRESSURIZATION FOR B.O.A.C.

IN the July 13th, 1950, issue of *Flight* we recorded the modification carried out by Trans-Canada Airlines on their Canadair Fours to equip the fleet with British Godfrey cabin blowers in place of the standard installation. By this means, T.C.A. budgeted to save themselves not far short of half a million dollars a year. Now comes the news that B.O.A.C. are following the Canadian precedent.

All B.O.A.C. Argonaut aircraft are to be fitted with the British equipment, and the conversion, which will be carried out in conjunction with Sir George Godfrey and Partners, Ltd., will, it is claimed, result in these advantages: there will be a saving of dollars as all spares will be supplied in this country; the expected overhaul period of 1,800 hours is three times that previously required; overhaul costs will be considerably reduced; and there will be a saving of weight of approximately 200 lb on each aircraft. It is expected that the cost of the overhaul programme will be reduced to one-ninth of the previous figure, and it is estimated that the complete expenditure on the modification will be recovered from reduced overhaul costs in one year of operations.

Reliability and ease of maintenance will be greatly facilitated by the simplicity of the installation, which comprises a Type 15 Mk 9 cabin supercharger driven through a Rolls-Royce adaptor gearbox with a step-up ratio of 4:1. The air is filtered before admission to the supercharger and after compression is passed through a silencer which smooths air pulses and reduces noise level.

The pressurization system has been designed to deliver to the cabin a constant mass flow of air from ground level to the maximum operational height, and the equipment will maintain a cabin altitude of 8,000 ft up to an operational height of 20,000 ft.

TWO WEEK-END EVENTS

Displays at Rearsby and Fair Oaks

THE glorious weather which favoured all flying centres last week-end encouraged large crowds from Leicester and the surrounding countryside to visit the Festival Year Air Display, organized at Rearsby by the Auster Flying Club. The programme of events offered plenty of variety and was given an appropriate send-off by the Lord Mayor of Leicester, Alderman T. Rowland Hill, J.P., who took off in an Auster Mk 5D fitted with "sky-speaking" equipment to broadcast, from above, his official opening.

There followed an assortment of entertaining events, including some excellent tied-together formation flying by Desford (No. 69 R.F.S.) Tiger Moths led by S/L. Howes; some contrasting high-speed formation flying by four No. 1833 (City of Birmingham) R.N.V.R. Squadron Seafires; and a "several too many at the lunch-time session" flight by the Goodyear "wobble-wheel" Auster.

Well ahead of schedule, Major Vogt led three other 31st U.S.A.F. Fighter Wing pilots from Manston through some rapid transits in immaculate formation, the Thunderjets trailing black smoke (on petrol, not kerosene) and according to the leader—over R/T. *via* the announcing system—clocking 610 m.p.h.

A quite delightful display by Mr. Grantham in an Olympia sailplane deserved the spontaneous applause of the crowd and, again in marked contrast, this event was followed by a lively effort by six Meteors of 504 (City of Nottingham) R.Aux.A.F. Squadron from Wymeswold, S/L. Beardsall leading.

Other entertainment was provided by an aerobatic M18 and Sea Fury, Mr. G. S. Baker in an old Cierva Autogiro and members of the Apex Group, one of whom flew round astride an Auster's landing wheel. A fourth high-speed event was provided in a most exhilarating manner by a single Meteor 7 from 504 R.Aux.A.F. Squadron. F/L. Beckett, Squadron Adjutant, was the pilot.

Of special and more technical interest were the first public demonstrations of the Auster military model "S" and the Aiglet Trainer, and, for Leicestershire farmers, a pair of crop-spraying Aiglets from Aerial Spraying Contractors of Boston, Lincs. On the model S for A.O.P. duties—flown up from Boscombe for the display—the huge wheels and tyres were noteworthy, while the installation of a Blackburn Cirrus Bombardier is commendably neat and compact. The Bombardier has direct fuel-injection and gives instant throttle response at all speeds.

The Aiglet Trainer with clipped wings (no jury struts), a full blind panel and two-stage amber has a most lively performance, as Mr. Ranald Porteous demonstrated; it promises to embarrass existing primaries by matching their performance while offering, as well, side-by-side seating and exceptional economy of cost, operation and maintenance.

A much appreciated burlesque concerned with road safety and staged by the Leicestershire and Rutland Constabulary turned an interval in the flying programme into a worthwhile period of instruction for drivers and pedestrians.

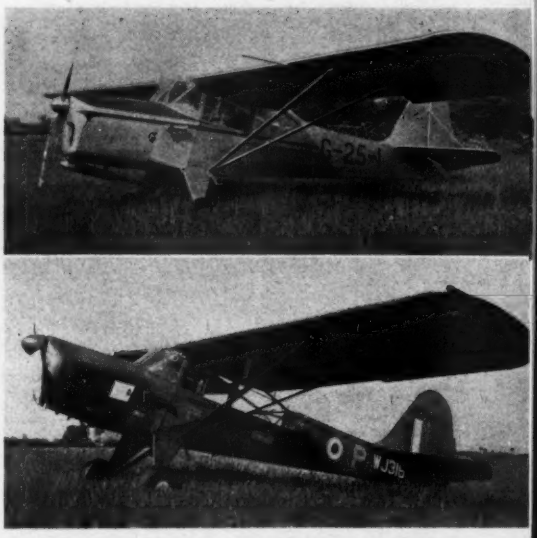
On the Sunday the navigation competition for the Ragosine Trophy was flown, the winner being Mr. Meake in an Autocrat (borrowed from Mr. Weston-Webb), and a popular second was scored by Mr. Fred Ringer, a flying farmer from Norfolk who ordered his Auster last year and took advantage of the company's offer of learning to fly, free of charge, which goes with a new Auster aircraft.

FAIR OAKS AT HOME

COMMENCING after Saturday's Reserve flying had been completed, a short but exciting flying display at Fair Oaks pleased a gathering of guests and local supporters before they repaired to the mess for dancing.

Particularly commendable on the part of both pilot and passenger was the demonstration circuit on which A.T.C. Sgt. Poulter, a pilot recently qualified under the flying scholarship scheme, flew Mr. Lionel Heald, K.C., M.P. for Chertsey. Mr. Heald has done a great deal to aid A.T.C. and private flying in this country.

No. 18 R.F.S. Chipmunks (photographs of which appeared in our May 18th issue) demonstrated some polished formation flying; and a single machine, Mr. Phipps up, matched their standard with its aerobatics. The London Transport Club's smart red Tigers also gave a good showing and, as was to be expected from such an experienced pilot, W/C. Arthur entertained with brilliant handling of a Fair Oaks Club Tiger. An open-to-all spot landing competition, in which Brooklands A.T.C. and other pilots took part, brought the evening's flying to a close.



Two entirely new Auster types, demonstrated at Rearsby: the clipped-wing Aiglet Trainer (above) and the Bombardier-powered Model S for military duties. "Flight" photographs

NATIONAL AIR RACES: VISITING AIRCRAFT

IN connection with the Festival of Britain 1951 National Air Races, to be held at Hatfield on June 23rd, the Royal Aero Club Aviation Centre has issued the following information.

Visiting aircraft, other than those competing in the races, will be allowed to land at Hatfield on June 23rd, between 1100 and 1230 hr B.S.T., only, and may leave only between 1830 hr and dusk. R.Ae.C. landing permits must in any case be obtained. Applications for these permits should be addressed to Mr. B. J. Snook, Air Touring Department, Royal Aero Club Aviation Centre, Londonderry House, 19 Park Lane, London, W.1, and must be received not later than Monday, June 18th.

Aircraft unable to reach Hatfield by 1230 hr may land at Luton up to 1345 hr, but after that time landing will be refused, as the airfield forms one of the turning-points in the King's Cup Race.

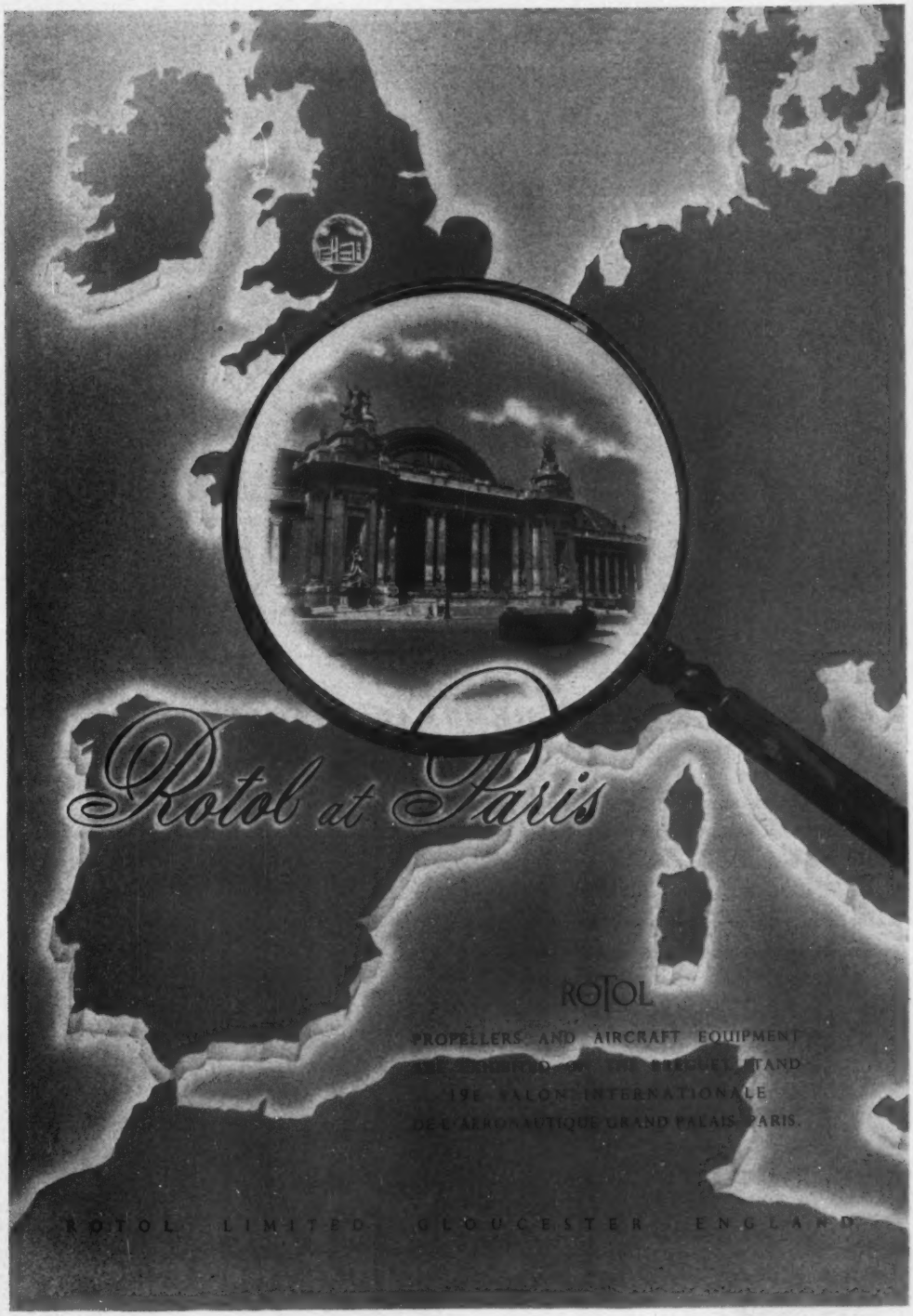
Members and associate members of the R.Ae.C. arriving by air will be admitted to the club enclosure free of charge upon production of their membership cards. Other visitors by air may purchase tickets for this enclosure at half the price to the general public. These tickets will be obtainable only from the deputy chief marshal in the visiting aircraft park on June 23rd.

HONOURING THE JET PIONEERS

(Continued from page 666)

Referring to the Sapphire agreement with Curtiss-Wright, Sir Frank said that almost at the end of his recent visit Mr. Roy Hurley, president of the Curtiss-Wright Corporation, said to him: "We have bought the Sapphire, and we think we have done well. Here is a present in return —and he gave the promise of full details of the planning work completed by his company on Sapphire mass-production. This had cost millions of dollars, but, even more important, would have taken us many, many months of painful time. That, Sir Frank submitted, was not only a good business relationship but a great relationship country to country.

MARSHAL OF THE ROYAL AIR FORCE VISCOUNT TRENCHARD proposed the health of Mr. Sopwith and Sir Frank Spriggs. If men like these were behind the R.A.F., he said, we need not fear. Sir Frank knew the importance of management and of bringing forward the promising young men. Viscount Trenchard recalled that he himself had been taught to fly by Mr. Sopwith—in ten days. After reporting to the first course of the Military Wing of the R.F.C. at Upavon, he was charged with setting examinations and helping to conduct them; in fact, he set his own papers, sat for them and passed himself, and, as he said, had kept a high standard ever since!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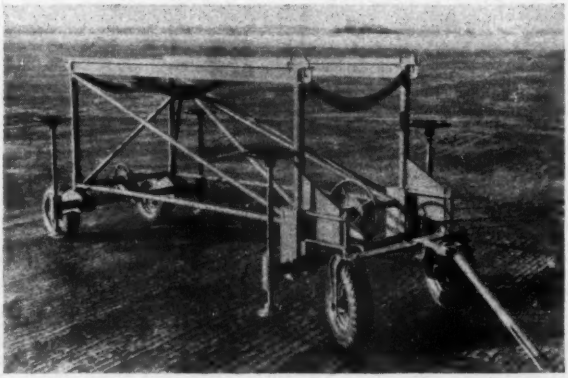

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CIVIL AVIATION NEWS

B.E.A.'S AIRCRAFT PROBLEMS

IN view of the good progress which B.E.A. has been able to report in recent months, it is indeed disappointing that unforeseen shortage of aircraft should now force the Corporation to cut back its intended services. The non-appearance of Ambassadors, and delays in the transformation of the Dakotas into Pionairs, are the causes of the trouble. Vikings continue to give sterling service, but very little increase in utilization is now possible with this type. Despite these frustrations, however, B.E.A. will be flying substantially more services during the month than in June, 1950, and if six Pionairs are delivered during the month, as is indicated at present, it should be possible to operate a full July programme.

A reference appears in these pages to the use of four-engined aircraft made available for B.E.A.'s London-Nice service by B.O.A.C. An extension of such arrangements, and additional agreements with the charter companies, might make it possible for B.E.A. to realize most of its aims for increased and improved summer services, and avoid handing-over too much of the traffic to foreign operators.

B.E.A.'s statement regarding the curtailment of services reads as follows : "As a result of serious delays in the delivery of Pionair and Elizabethan class aircraft, the Corporation has to announce with a sense of frustration that certain services will have to be cut back during the month of June." The routes affected will be :—

(1) London-Oslo cancelled, June 1st-July 1st. Passengers already booked by B.E.A. will be transferred to S.A.S. unless they wish to make other arrangements.

(2) London-Amsterdam night excursion service will be operated during June by Hunting Air Travel, Ltd., under charter to B.E.A.

(3) Glasgow-Benbecula-Stornoway services, planned with Pionairs, will be operated during June by D.H.89 Islanders, but capacity will have to be reduced.

(4) Stornoway-Inverness services cancelled, June 1st-July 1st.

(5) Glasgow-Aberdeen-Orkney-Shetland services, planned with Pionairs, cannot be operated. Glasgow-Aberdeen sector will be cancelled, but services between Aberdeen, Orkney and Shetland will be operated by D.H. 89s of reduced capacity.

(6) Certain services inside Germany will have to be cut back, and additional services between London and Paris with the Elizabethans cannot now be introduced.

These changes will mean a heavy financial sacrifice by B.E.A. The reason for the delay in delivery of Elizabethan aircraft is the need for further extended technical trials on the part of the manufacturers before a C. of A. can be granted. B.E.A. now hopes to introduce the Elizabethans for the winter programme.

The Pionair delays are a result of the critical shortage of materials, aggravated by labour troubles at Prestwick.

TRANSFER OF YORKS

AN official announcement from B.O.A.C. and the Lancashire Aircraft Corporation last week-end confirmed that a contract has now been arranged for the sale of 23 Yorks withdrawn from B.O.A.C. services last year. The price to be paid by Lancashire Aircraft for the machines and some spares is £140,000. The Yorks are understood to be in good condition, but they will be stripped of seating and furnishing on delivery. The first machine was flown out of Hurn on May 31st, and the others are following without delay. L.A.C. will re-equip them as rapidly as possible with 50 folding seats, broadly speaking in conformity with Transport Command requirements, and contracts have already been accepted for some of the Yorks, the first commencing as soon as June 12th. It is the intention of Lancashire that these Yorks shall become a merchant air fleet—tramps, in fact, flexible in equipment and ready to carry freight or passengers, or both. One of the first duties will be to fly R.Aux.A.F. ground personnel with their bags and equipment to their summer camps at home and overseas. Subsequently, trooping commitments to the Far East will probably be undertaken.

In addition to their 23 mixed-traffic Yorks, Lancashire will continue to operate their five all-freight Haltons. B.O.A.C. for their part are retaining their ten York freighters which operate on the Australian route, but also do occasional duty for the carriage of the company's spares and sometimes on training work. These machines mostly have the strengthened freight floors and large double doors. Two or three of them could be equipped with seats at short notice and made available for charter work.

B.O.A.C.'s first operations with Yorks were on the U.K.-Cairo route early in 1944, and the service was later extended to Calcutta. In November, 1945, they also opened the London-Johannesburg Springbok service. Some of these original machines are among the twenty-three sold, others are ex-B.S.A.A.

B.E.A. HELICOPTER SERVICE STARTS

ONE of the first passengers on the new Birmingham (Hay Mills) to London (Northolt and Heathrow) helicopter service was Mr. Nabarro, M.P., the member for Kidderminster. He used it to save time in travelling to Westminster. At question time in the House the same day he asked Mr. Beswick, Parliamentary Secretary to the M.C.A., whether there were any technical or economic obstacles to the erection of rotor stations as superstructures on main railway termini. To this enquiry he received a typical Parliamentary answer : "Without accepting the premise that this would be economically or operationally feasible we do not rule out the erection of superstructures over railway stations."

The service operates three times daily—0700, 1205 and 1600 hr from the Hay Mills rotor station, which is some three miles distant from the centre of Birmingham. The journey to Northolt takes 70 minutes and the crossing to Heathrow (London Airport) a further ten. Fares are £2 10s. single and £4 10s. for the return journey. If seats are available, the service between the two London airports may be used at £1 each way.

At the moment the service is being run by five pilots and three 3-seater Westland-Sikorsky S51 helicopters. Cruising speed is 85 m.p.h. and, according to the weather and the section being flown, a height of between 500ft and 1,500ft is maintained.

Within the next two years B.E.A. hopes to be using the 12/14-seat Bristol 173 helicopter and the four-seat Bristol 171 may be employed in the interim. The thrice-daily service (except Sundays) will be continued until the end of August. During September it will fly twice a day, but during the winter once only.

B.E.A.'s helicopter unit is in the charge of W/C. R.A.C. Brie, who was for many years with the Cierva Autogiro Company.

B.E.A. FOUR-ENGINED SERVICES TO NICE

NIGHT excursion services operated by B.E.A. between London and Nice are proving very popular, and as a result special arrangements have been made for four-engined aircraft to fly them on certain dates during this month. Fortunately for B.E.A., the sister Corporation is able to make available Constellations or Argonauts for the job; so, for example, during this coming week-end (June 8th-10th), a 43-seat B.O.A.C. Constellation will take over the service from the usual Viking on the nights of Friday, Saturday and Sunday. Again, on each night from June 15th until July 1st, the service will be flown by a 40-seat Argonaut. Departure times for the out and return services will remain unchanged, but London Airport will be used instead of Northolt.

I.A.L. NEWS

AT the request of six international airlines, International Aeradio, Ltd., have appointed two meteorologists to provide route forecasts at Yesilkoy Airport, Istanbul. The installation of radio teletype at Farouk Airport is another of the company's activities, and this will be used for communications on the normal aeronautical fixed telecommunications network. Recently A. Cdre. C. S. Cadell, managing director of I.A.L., attended the first directors' meeting in Singapore of International Aeradio (Far East), Ltd., which commenced operations on May 1st. The company has taken over the workshops of Malayan Airways at

"Flight" photograph

London Airport as seen by a passenger arriving from Northolt by B.E.A.'s new Birmingham—London helicopter service. The only "runway" required is a small circle on the tarmac.

CIVIL AVIATION . . .

Kallang Airport and will be carrying out radio maintenance on behalf of various airlines there.

Incidentally, the company's annual home conference for overseas representatives took place recently, followed by a cocktail party at London headquarters, 40 Park Street. The Middle East (Cairo), Pakistan (Karachi) and Caribbean (Trinidad) representatives, Messrs. W. Bell, A. Lowe and R. Wilson respectively, were present.

AIR MAIL SHORTCOMINGS

THERE have been frequent complaints that the full benefit of the potential speed of air mail services is not being felt by the public, and as a result the Post Office is examining the matter. A drive to produce general improvements in the service—particularly in handling at the collection and delivery stages—is probably connected with Government considerations for the revision of the mail rates to be paid to the British Corporations.

There are strong grounds for supporting the proposals that the rates should be increased, for by comparison with other international carriers B.O.A.C. receives 1.9 gold francs per ton-kilometre less than the standard scale.

THE HONG KONG SKYMASTERS

COMMUNIST China may not, after all, get the 40 aircraft still at Hong Kong, which according to a recent court ruling are legally its property. The successful claim was made on the grounds that the present regime was recognized by Britain and so had legal rights to Chinese government assets on British soil. It is now suggested in Washington that the United Nations embargo on supplies to the Chinese Communists will prevent the transfer of the aircraft to the Pekin authorities.

FARES UP, DOWN AND STEADY

RISING costs throughout the world have decided 62 member-operators of I.A.T.A. at a Bermuda conference to increase standard North Atlantic fares next year by 5.33 per cent. There will be no increases between North, Central and South America.

To encourage off-season travel, however, special tourist fares will be introduced on both the London-South Africa and trans-atlantic routes. As part of I.A.T.A.'s programme to encourage mass air travel cheaper fares for tourists will be introduced on international scheduled airline services on October 1st, 1952.

As a result of the I.A.T.A. Bermuda conference, international air traffic between the countries of North, Central and South America have been brought under a uniform fares and rates pattern for the first time in the history of air transport.

EXPEDITING EGRESS

THE extension to the existing passenger departure building at London Airport has now been completed, and on Monday, May 28th, the new premises were taken over by the Airport authorities; later there was an informal ceremony at which air hostesses from B.O.A.C., Pan American Airways, K.L.M., and Air France unfurled the flags of their respective countries over the building. The ground floor comprises a baggage hall, waiting hall, Customs offices, baggage lock-up, marshalling rooms, etc., whilst the upper floor is given over to offices for the various airline companies.

The building, work on which was begun only in January of this year, was designed by Air Ministry architects in collaboration with the staff architects of Wates, Ltd., the builders. It is constructed on this firm's "non-traditional" principle of pre-cast concrete units assembled on the site for the external walls; these, with the *in situ* columns formed at their joints, form the main part of the load-bearing structure.

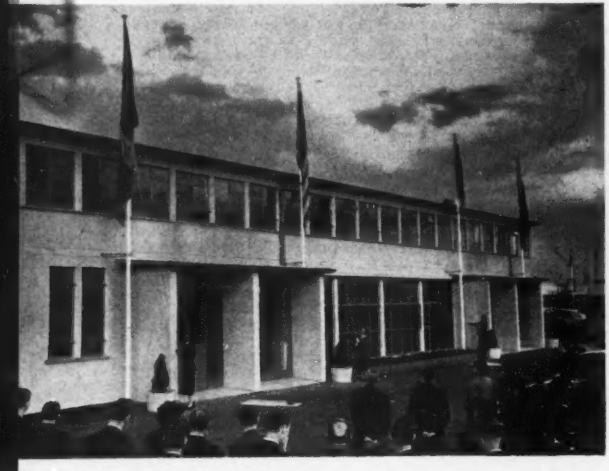
It is claimed that the new building, which has a pleasant colour-scheme of off-white walls and turquoise paint-work, is the first example of the application of this method of construction to a commercial building in this country. The new offices are expected to form a permanent part of the airport layout, and Wates, Ltd.—whose H.Q. are at London Road, Norbury—are already in process of constructing further premises nearby.

BREVITIES

ON May 27th Aer Lingus completed its fifteenth year of operation, having logged almost 14 million miles. During this period not one of the passengers carried by the airline has suffered a serious or fatal injury—a remarkable record.

* * *

On June 1st, B.O.A.C. re-introduced their New York-Bermuda service, which has been suspended since March, 1950. This "Bermudian" service is now operated three times a week in each direction with Constellations, leaving New York on Fridays, Saturdays and Sundays and returning on Saturdays, Sundays and Mondays. Flying time from New York to Bermuda is 3¼ hours. B.O.A.C. already operate thrice weekly flights between New York and Nassau, and twice weekly services between Nassau and Bermuda. The new service completes a triangular pattern.



BETTER PASSENGER FACILITIES: London Airport's extended passenger-departure terminal is seen here on the occasion of the opening ceremony, at which four stewardesses of four main airlines hoisted national flags.

The manager of the Scottish Division of B.E.A. has written to members of the Aberdeen Chamber of Commerce saying that because of the shortage of aircraft and crews there will be no increase this summer in North of Scotland air services operated by the Corporation. This statement to the Chamber of Commerce was in reply to protests forwarded from Orkney and Shetland concerning the inadequate number of seats on their island services. Another letter is to be sent to B.E.A. expressing dissatisfaction both with the service and the reply received.

* * *

In answer to a question in the House of Commons recently, Mr. Beswick confirmed that B.E.A. had tentatively suggested that the Brabazon might be operated by them on routes of high traffic-density. A considerable amount of development work still had to be done before the aircraft could be used commercially he said.

* * *

On June 1st a new M.C.A. publication, *Licensing of Aerodromes for Aircraft not exceeding 11,000 lb maximum total weight* (MCAP 87) was published by H.M. Stationery Office, price 1s. 9d. It is intended as a guide for airfield owners and prospective owners in the selection of sites and it details licensing procedure and requirements. Sections deal fully with markings and signals required both for land and water bases by day and night.

* * *

Discussions have been taking place between I.A.T.A. and the International Police Commission in connection with smuggling and thefts, with a view to establishing the closest possible co-operation between the world airlines and national and local police authorities. Sir William Hildred has pointed out that the safest way to ship cargoes is by air, and the intention is to preserve this state of affairs.

* * *

Any young man with an inclination towards work in the wide open spaces, and who possesses a diploma or degree in civil engineering, besides initiative and an ability to handle men, may find it worthwhile to contact the Australian Department of Civil Aviation. Increased work in the maintenance of airfields in Australia's eleven territories has caused vacancies for airport inspectors and assistants.

Details of B.O.A.C.'s numerous facilities for the carriage of air freight from the United Kingdom are given in a comprehensive booklet recently published by and available from the Corporation.

* * *

Pan American World Airways, at present operating a twice-weekly Constellation service from New York to Johannesburg, have now applied to the C.A.B. for permission to serve Casablanca, thus making an extra stop between Lisbon and Dakar.

* * *

B.E.A.'s London-Brussels evening service has now been extended to Dusseldorf, returning the following morning. Three daily services from London are thus provided to Dusseldorf in addition to its daily links with Berlin and Munich.

* * *

The Australian government has authorized expenditure of £20,000 for the construction of an airport on Fisherman's Island, seven miles from Port Moresby. This will be used as an alternate to the existing airport, which is often closed by bad weather. The new strip should be ready in about three months.

* * *

Starting today, B.E.A. are operating a daily return service between London and Milan, the non-stop flight taking 5¼ hours. Passengers to and from Italy can now book tickets giving them a choice between Milan and Rome departure or arrival.

* * *

Because of increases in local motor-coach fares between Bordeaux and Biarritz, B.E.A. have had to raise the overall return fare from London to Biarritz by £2 13s. The excursion fare between London and Paris has been increased by £1 as from today in accordance with an I.A.T.A. agreement.

* * *

Compared with the corresponding period for last year, an increase of 25 per cent in international air traffic transactions through the I.A.T.A. Clearing House was made during the first quarter of 1951. Turnover from January to March was $36,916,000 as against $29,372,000 in 1950.

* * *

On May 24th a Hunting Aerosurveys expedition left Luton Airport in a Percival Survey Prince, bound for the Middle East territory of the Sheikh Abdulla as-Salim as-Subhah, who has commissioned the company to prepare large-scale photo-mosaics of Kuwait and the surrounding 95 square miles. The Prince, which is equipped with a Williamson Eagle IX camera, is captained by John Saffery, D.S.O.

* * *

Six more German girls, whose predecessors are already flying in Germany, have now started training as B.E.A. stewardesses. This eighteenth stewards' introductory course is the first to be composed entirely of girls. B.E.A. intends to increase the number of stewardesses to equal that of the stewards and the larger aircraft which the Corporation hopes soon to be operating will have both a steward and stewardess on board.

* * *

Since the College of Aeronautical and Automobile Engineering at Chelsea began its civil aircrew training course last July, all who have taken it—over 100 pilots and flight engineers—have passed their A.R.B. examinations. Over 60 pilots have been sent on the course by B.E.A., whose own training section has been closed, to be trained for A.R.B. type-endorsement on current aircraft. Other students, both private and from charter companies have obtained both initial licences and type endorsements.

SHAPING WELL. Certain changes to the power installation—four Bristol Proteus turboprops—of the Type 175 airliner on order for B.O.A.C. are shown in this latest artist's impression of the aircraft. In particular, the new shape of the engine nacelles and jet outlets will be noted.

* * *

Out of a total world-wide staff of 16,000, just over 3,000 B.O.A.C. employees are women. The job most in demand is that of air stewardess, and the Corporation has received some 5,000 applications during the past five years.

* * *

Of letters, letter packets and postcards flown from the U.K. to European countries at normal international postal rates, B.E.A. carries 85 per cent. Special night-mail aircraft carry some, while the remainder is flown in B.E.A. freighters and on normal passenger services. The bulk of mail sent by Air Parcels Post to the Continent is also carried by B.E.A., but for this there is an airmail surcharge.

* * *

Two British air stewards have been sentenced to twelve months' imprisonment and each fined £E500 (subject to confirmation by the Egyptian Minister of War and Marine) by an Egyptian court martial in Cairo. They tried to smuggle a number of gold bars out of the country and were to be paid for delivering them to Calcutta at the suggestion of a man they met in Cairo.

* * *

The shortage of commercial aircraft—particularly in America—resulting from the war in Korea, has been mentioned on several occasions. An indication of the extent of non-combatant air support is given by a recent I.C.A.O. announcement in Montreal that commercial and military aircraft supporting U.N. action in Korea flew more than 250,000 miles in the peak month.

* * *

Direct R/T. communication was introduced by Canadian Pacific Airlines on their overseas flights for the first time on May 17th. Captain van Hee, in the *Empress of Sydney*, took off from Vancouver on the regular schedule to Honolulu and Sydney, with seven points available as contact stations: Seattle, San Francisco, Los Angeles, Honolulu, Canton Island, Nadi in Fiji, and Auckland. Position reports are transmitted every hour, and "all's well" messages every half hour.

WOLVERHAMPTON WINNERS: Although they did not know they were to be first and second respectively in the Goodyear Trophy Race, Messrs. Dunkerley and Cole (left and right respectively) were in cheerful mood before take-off. Dunkerley was discussing his chances in the Miles M.28 with Mr. Phillip Mayne, the official timekeeper; Cole was making a last exterior check of his well-preserved Comper Swift.

SERVICE AVIATION

Royal Air Force and Naval Aviation News

N.S. Aircrews

ADDRESSING members of the Birmingham University Air Squadron and other R.A.F. Reserve Units during his visit to Castle Bromwich recently, Mr. Arthur Henderson, the Secretary of State for Air, stressed the importance of the R.Aux.A.F., which he hoped many members of the University Air Squadrons would join.

Mr. Henderson also announced a new scheme, now to be introduced, under which National Servicemen could volunteer to serve in the R.A.F. as pilots or navigators for four years, instead of the normal two years followed by four years on the Reserve.

This new opportunity is open to all National Servicemen, including those already serving. Those accepted under the scheme will serve on a regular engagement and receive regular rates of pay from the date of their acceptance. On completion of engagement a gratuity will be paid at the rate of £175 for each year of service completed after receiving wings.

All pilots and navigators serving under this scheme will receive probationary commissions on the successful termination of a short period of initial training, and will be confirmed in rank on completing their flying training.

Elaborate Electronics

IN his address as reviewing officer at the passing-out parade of the 59th Entry to No. 6 Radio School on Thursday of last week, Air Marshal C. W. Weedon, Controller of Engineering and Equipment at the Air Ministry, gave some interesting sidelights on modern air warfare.

Electronics, he said, enabled us to intercept an average of 6 per cent of enemy aircraft in the Battle of Britain. This was sufficient to save the country at that time, but in any future war 100 per cent would be necessary.

Remarking upon the complicated radar installations necessary in military aircraft, the air marshal said that it took longer to design and build the electronics than it did the aircraft which would carry them. He emphasized this by pointing out the fact that there would be over 1,000 electronic valves in each of our new four-jet bombers —"and later it will get much more complicated." A similar reference, it will be remembered, was made in recent speech by Air Chief Marshal Sir Hugh Lloyd.

Congratulating the entry on their choice of occupation, Air Marshal Weedon told them that their prospects of advancement were excellent because there were only 20 per cent of the skilled men available of those required to fill the established posts.

In his report on the entry the commanding officer of the school, G/C. R. J. P. Morris, said that of the 54 apprentices examined 18 qualified as Junior Technician Ground Radar Fitter (B) and 23 as Junior Technician Air Radio Fitter, while thirteen failed. Educationally, 11 per cent. passed with credit, 82 per cent passed and the remainder failed.

Carrier Movements

THE visits of H.M.S. *Triumph* to Torbay and *Illustrious* to Eastbourne are both cancelled. This is because carriers are being used to transport the 16th Parachute Brigade to Cyprus.

H.M.S. *Ocean*, now being refitted at Rosyth, will join the Mediterranean Fleet on completion of her trials.

In the event of the war in Korea continuing, the Australian carrier *Sydney* will relieve H.M.S. *Glory* on the completion of her six months tour of duty in October next.

During July H.M.S. *Vengeance* will embark No. 1830 R.N.V.R. Air Squadron for 14 days. Training will be carried out over the Irish Sea and the Channel, and Scilly will be visited.

CONSIDERED OPINION : The Under-Secretary of State for Air, Mr. Aidan Crawley, discusses the qualities of the Avro Shackleton with S/L. Farr and G/C. Keddie, on returning from a training exercise. *(See "Shackletons at Kinloss" on this page.)*

Shackletons at Kinloss

BRITAIN'S newest and biggest maritime-reconnaissance aircraft, the Shackleton, is now in service with Coastal Command at Kinloss, Morayshire. At dawn on May 28th, Mr. Aidan Crawley, Under-Secretary of State for Air, joined the crew of a Shackleton and went on an exercise off the northern coast of Scotland to see for himself the capabilities of this 120ft-span anti-submarine aircraft.

Owing to the failure of an oil-pressure gauge, one of the four Griffons had to be feathered soon after take-off, but S/L. P. G. D. Farr, D.F.C., in command of the crew of ten, decided to continue, and for the remainder of the trip the Shackleton performed admirably on three engines. An exercise with units of the Home Fleet had been arranged, and for the next four hours the aircraft escorted a convoy.

The Shackleton has been specially designed for long-range reconnaissance, and has sufficient range to solve the problem of the Atlantic "gap". In any future war it would be able to fly sufficiently far out to take over convoy escort from aircraft approaching at maximum range from the other side.

When he returned to Kinloss, Mr. Crawley—who was a pilot in the recent war, until shot down and captured in the Middle East—said: "Despite the fact that we were operating on three engines most of the time the Shackleton was easily handled and the crew have great confidence in her. I found, during the short spell I was piloting, that despite her size she is very sensitive. Heating is excellent, the range is tremendous and there is more room to move around than there was in a Lancaster.

"We were on a joint exercise with the Navy and had to do convoy patrol, for which duty the Shackleton is ideally equipped. She has a small galley and two bunks."

PRIZE-WINNERS of the 59th Entry, No. 6 Radio School : A/App. R. C. Carter (Air Radio Fitter); A/App. R. A. Dixon (Ground Radar Fitter); Cpl. A/App. A. R. Hughes (Highest Educational and Aggregate marks); Cpl. A/App. P. J. Rae (General Service subjects); A/App. B. G. Wheelton (Victor Ludorum trophy for sports). "Flight" photograph

B.A.F.O. Small Arms Contest

BEFORE presenting the prizes at the conclusion of the annual championship meeting of the B.A.F.O. Small Arms Association recently, the C-in-C., B.A.F.O., Air Marshal Sir Thomas M. Williams, said that this was probably the most successful of the five championship meetings held so far. He considered that the results reflected very great credit on the competitors, for no fewer than five teams had beaten the best team score put up last year. Results :—

B.A.F.O. Command Station Team Championship. S.R. (A).—1st, Gutersloh (1,132 points); 2nd, Celle (1,125).

S.R. (B) Station Team Match.—1st, Luneberg (514 points); 2nd, Gutersloh (510).

B.A.F.O. Command Individual Revolver Championship.—1st, S/L. Willott, H.Q. Unit, B.A.F.O. (161 points); 2nd, L.A.C. Gill, Luneburg (147); 3rd, F/Sgt. Furlong, Wunstorf (129).

First-stage Revolver Championship.—1st, S/L. Willott, H.Q. Unit. B.A.F.O. (79 points).

B.A.F.O. Command Station Team Championship (Revolver).—1st, H.Q. Unit, B.A.F.O. (221 points); 2nd, Wunstorf (199).

B.A.F.O. Command Rifle Championship and Grand Aggregate Challenge Cup.—1st, S/L. Willott, H.Q. Unit, B.A.F.O. (335 points); 2nd, Cpl. Cox, Gutersloh (320); 3rd, S/L. Calvert, Sundern (312).

Young Officers' and Young Airmens' Challenge Cup.—1st, Cpl. Parker, Luneburg (160 points); 2nd, Cpl. Cox, Gutersloh (155).

Tyro Challenge Cup.—1st, Sgt. Matherson, Wunstorf (106 points); 2nd, Sgt. Webber, Fassberg (102).

Rifle Twenty Matches R. (B).—1st, S/L. Willott, H.Q. Unit, B.A.F.O. (136 points); 2nd, L.A.C. Gill, Luneburg (134); 3rd, W/C. Coulson, Sylt (133).

B.A.F.O. Small-bore Inter-Station Rifle League.—1st, H.Q. Unit, B.A.F.O. (1,168 points average); 2nd, Gutersloh (1,147); 3rd, Sundern (1,139).

B.A.F.O. Small-bore Inter-Station Pistol League.—1st, H.Q. Unit, B.A.F.O. (333.66 points average); 2nd, Sylt (313.66); 3rd, Wunstorf (307).

B.A.F.O. Small-bore Individual Rifle Championship.—1st, S/L. Willott, H.Q. Unit, B.A.F.O. (98.625 points average); 2nd, S.A.C. Pankhurst, H.Q. Unit, B.A.F.O. (97.875); 3rd, W/O. Murray, Gutersloh (97.5).

B.A.F.O. Small-bore Individual Pistol Championship.—S/L. Willott, H.Q. Unit, B.A.F.O. (90.83 points average); 2nd, Sgt. Maider, Sylt (84.75); 3rd, S/L. Calvert, Sundern (82.66).

W.R.A.F. Competition.—1st, A.C.W. Johnson, Wunstorf (41 points); 2nd, A.C.W. Walker, Wunstorf (39).

R.A.F. Regiment Squadron Rifle and Light Machine-Gun Championship.—1st, No. 60 (Rifle) Squadron (569 points); 2nd, No. 57 (Rifle) Squadron (549); 3rd, No. 3 (Armoured Car) Squadron (529).

In addition, L.A.C. Gill was awarded a special bronze medal for beating S/L. Willott in the second stage of the individual revolver championships. S/L. Willott was King's Prize winner in 1946 and is also a British Olympic pistol shot. He has been R.A.F. champion seven times and four times revolver champion.

PROVOST is the official name of the Percival P.56 basic trainer, an Alvis Leonides-engined prototype of which is seen in this recent "Flight" photograph. A version with the older Armstrong Siddeley Cheetah engine is also flying, but no mark numbers have yet been allocated.

More Jets in Korea

THE South African Minister of Defence, Mr. Erasmus, has announced that No. 2 Squadron S.A.A.F., now serving in Korea, will shortly be re-equipped with British jet aircraft.

Retirement

THE retirement of Air Chief Marshal Sir Alec Coryton has been announced. He will, however, continue in a civilian capacity as Chief Executive (Guided Weapons) in the Ministry of Supply.

G Class Recall

THE first 1,200 of the 8,600 released R.A.F. officers and G-class reservists to be recalled this summer reported at four centres on Saturday last.

They will undergo a 15-day refresher course in control and reporting organization. During training these reservists will receive normal R.A.F. pay and allowances, and on completing the course in a satisfactory manner will earn a bounty of £4.

All reservists to be called up this summer will receive recall notices 21 days prior to their reporting date.

Canadian Coastal Squadron Here

NO. 405 (Maritime) Squadron of the Royal Canadian Air Force has arrived at R.A.F. Station, St. Eval, Cornwall, for a month's training with Coastal Command.

Scottish R.O.C. Exercise

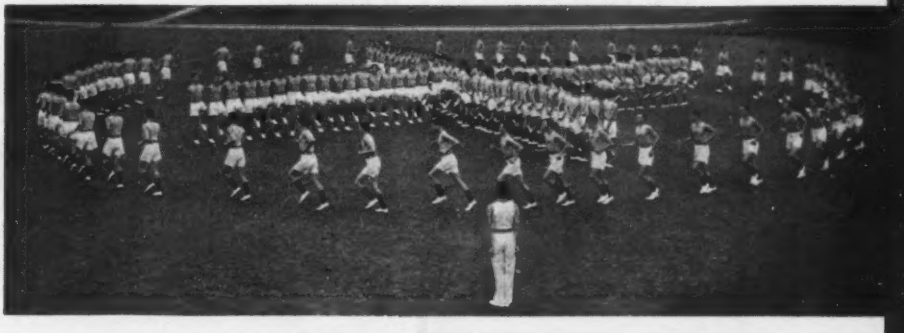
MORE than 1,800 men and women of the Royal Observer Corps were on duty in Scotland last Sunday for their major annual exercise. Aircraft for the purpose were drawn from Scottish- and Irish-based squadrons, and special low-flying areas were instituted.

R.A.F.A. Conference

AIR MARSHAL SIR RICHARD PECK will preside at the two-day R.A.F.A. conference, which opens at Torquay tomorrow, June 9th. This meeting will mark the 21st anniversary of the Association's inception.

There are no fewer than 150 branch resolutions to be considered, but delegates and visiting members expect to find time to mix a little pleasure with business.

There will be a reception by the Mayor on Saturday evening after the conference closes for that day, and a memorial service on Sunday morning in Princess Gardens. A Short Sunderland and various R.A.F. marine craft will be anchored in Torbay for inspection by visitors.



P.T. REHEARSAL at Halton for the Royal Tournament, which opened at Earls Court, London, last Wednesday, June 6. The R.A.F. performers are 128 National Servicemen, who go through an intricate routine without a word of command. The event is brought to a conclusion with a maze-march at the double.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

A Veteran's "Years of Retirement"

ANY of your readers who saw the sprightly performance of the 1912 Blackburn monoplane at the R.Ae.S. garden party at White Waltham a few weeks ago will, I feel sure, be interested in the enclosed picture of the same aircraft in 1913.

The gentleman in front of the heap is Mr. Montague F. Glew, its original owner, who apparently flew it a lot before writing it off. Having done so, he lifted the wreckage just as it lay and dumped it on his farm, some in a shed and some under one of those "haystacks on stilts." There it remained until the Shuttleworth Trust people found it and rebuilt it. Its present performance is, I am sure you will agree, a great tribute to its original makers and to the energy and skill of the Shuttleworth Trust engineers.

Hayes, Middlesex. JOHN W. R. TAYLOR.

How the 1912 Blackburn monoplane, demonstrated at the recent R.Ae.S. Garden Party, appeared on an unlucky day in 1913 (see first letter).

More About Longbridge—and Service Sons

RECENT correspondence about the landing of Austin-built Fairey Battles at what Mr. Kelsea-Williams (May 25th) calls the "astonishing" landing ground at Longbridge leads me to recollect—and I believe I am right—that the late Neville Stack crashed a Battle there. I believe his engine failed and he tried to scrape in, but hit the side of the hill, the flat top of which formed the airfield.

On recovering from the accident, in which he broke both legs, he walked without a limp, for each leg was shortened by the same amount. Subsequently he served in the Naval Air Arm and then in the Glider Pilot Regiment, so he flew for all three of the armed Services.

Both Stack's sons were squadron leaders. Several senior officers, incidentally, each had two sons flying in the Services at the same time. Howard Williams had two squadron-leader sons; Alan Goodfellow rejoined the Naval Air Arm *because* both his sons were flying; A. Cdre. "Bertie" Drew had two squadron-leader sons, one of whom was killed; and Air Chief Marshal Sir Arthur Longmore also lost one of his two sons in the Service.

Birmingham. G. G.

Immortal Inventions Dept.

I WAS most interested in the photograph on page 613 of your issue of May 25th, showing two crew-members of a U.S. Troop Carrier C-47 engaged in a bitter and unyielding fight for superiority over a shower of surrender leaflets.

I was particularly interested because I can claim to have pushed approximately 1,673,596 leaflets down the flare-chute or through the windows of an assortment of aircraft ranging from the Hampden to the Lancaster III; and to have entirely covered with them an area of Western Germany bounded by Osnabruck on the north, Frankfurt to the south, and extending eastwards as far as Berlin itself.

It is, therefore, with considerable surprise (having duly accepted the dictum of American superiority in "know-how," coupled with the traditional transatlantic efficiency in delivery) that I note the two crew members in your picture to be adopting the obsolete ejection technique known as B.B.O., or, more familiarly, "Bung the ——s out!" This system, as we intrepid early experimenters in leaflet distribution quickly realized, suffers from the major defect that that which is bunged immediately returns to the bunger threefold, and he is consequently immersed in a blinding shower of airborne propaganda within the confines of the aircraft fuselage.

When this takes place in pitch darkness, and when each leaflet has a substantial coating of oil, hydraulic, type "A," the result is somewhat confusing, to say the least. However, in 1942, a piece of brilliant research was performed by an A.C.H., whose immortal name is lost to posterity. Utilizing for the purpose the flight-commander's electric fan and a roll of suitable parchment easily obtained, he arranged for each bundle of leaflets to be packed loose, but with an elastic band (Stores Ref. Sec. 13A/WAAF Black-out, for retention of) placed around *one* end of it. The bundle was then ejected with the elastic end first. This successfully retained the leaflets in a neat packet until they hit the slip-stream, whereupon the bundle disintegrated clear of the aircraft and the leaflets floated Ruhrwards on the night breeze, bearing their message of hope to a despondent enemy.

Belfast. J. R. BUSHBY.

IN BRIEF

Mr. L. E. Bluck, 4, Croydon Road, Erdington, Birmingham, has a complete set of *Flight* issues (less those missing as a result of the printing dispute) from May, 1949, to May, 1951. He is willing to deliver them to any A.T.C. unit, youth club or similar organization within reasonable distance of Birmingham.

FORTHCOMING EVENTS

June	8-10.	Air Circuit of Sicily.
June	8-15.	Spanish International Rally.
June	9.	Rally and Race, Fairwood Common Aerodrome, Swansea.
June	9-10.	Royal Air Forces Association: Annual Conference, Torquay.
June	10.	Lancashire Aero Club: "At Home" (sponsored by A.B.A.C.).
June	15-18.	Royal Danish Aero Club: International Rally.
June	15-	Paris Aero Show.
July	1.	
June	23.	R.Ae.C.: Festival of Britain National Air Races, Hatfield.
June	24.	International Rally, Pisa, Italy.
June	24.	Northern Heights Model Flying Club: Gala Day, Hawker Airfield, Langley.
June	27-28.	Institute of the Aeronautical Sciences: Annual Summer Meeting, Los Angeles.
June	30-	Cognac International Rally, France.
July	1.	
June	30-	R.Ae.C.: Members' Deauville Rally.
July	2.	
July	1.	International Rally, Savona, Italy.
July	4-11.	F.A.I. Committee Meetings, Brussels.
July	7-8.	R.Ae.C.: Members' La Baule Rally.
July	7-8.	International Wakefield Cup Model Contests, Finland.
July	14.	Bristol Corporation: Air Race Meeting.
July	14.	S.M.A.E. Festival of Britain Model Championships, Wembley.
July	15-18.	Royal Danish Aero Club: Rally.
July	15 22.	Aero Club of Italy: International Air Week.
July	16-20.	Aeronautical Union of Jugoslavia: International Parachute-Jumping Competitions.
July	19-21.	R.Ae.C.: International Rally and "Fifty Years of Flying" Display and Exhibition.
July	20-22.	Yorkshire Aeroplane Club: International Rally.
July	22.	Luton Flying Club: "At Home" (sponsored by A.B.A.C.).
July	22-29.	National Gliding Championships Camphill, Gt. Hucklow, Derbyshire.
July	29.	Columbus Centenary Rally, Genoa.
Aug.	4-5.	Aero-Club de Touraine: International Rally, Tours, France.
Aug.	6.	*Daily Express* Challenge Trophy International Air Race, Shoreham Airport, Sussex.
Aug.	18.	International Air Circuit of Switzerland.
Aug.	18.	Wiltshire Flying Club: Thruxton to Isle of Wight Air Race.
Aug.	19.	Yorkshire Aeroplane Club: "At Home" (sponsored by A.B.A.C.).
Aug.	25-26.	International Air Circuit of the Dolomites, Italy.
Sept.	2.	A.B.A.C. Summer Convention.
Sept.	3-7.	R.Ae.S. and I.Ae.S.: Third Anglo-American Aeronautical Conference, Brighton.
Sept.	10-16.	Battle of Britain Week.
Sept.	11-16.	S.B.A.C.: Flying Display and Exhibition, Farnborough.

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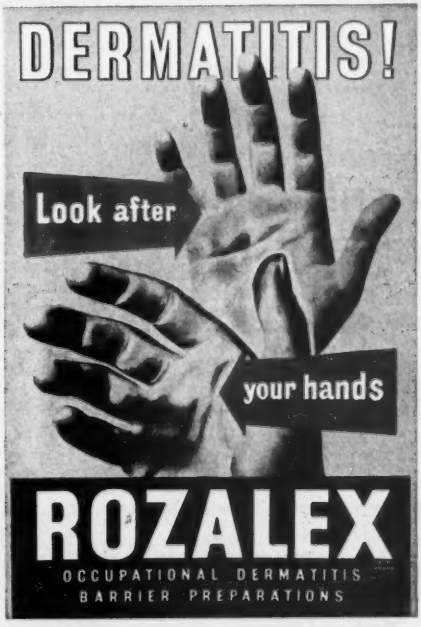

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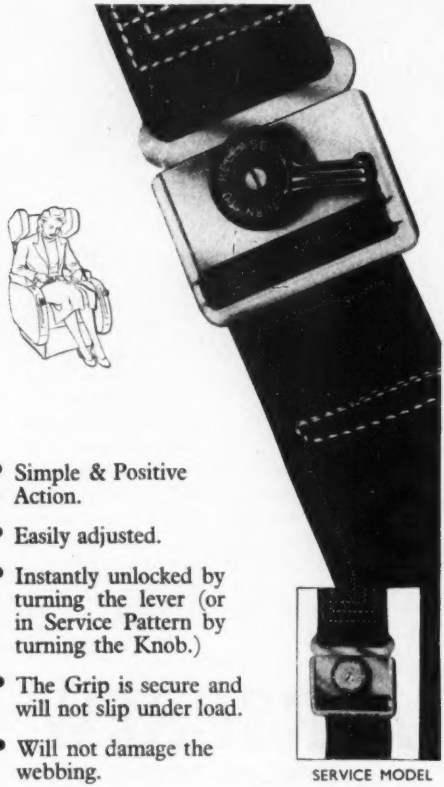

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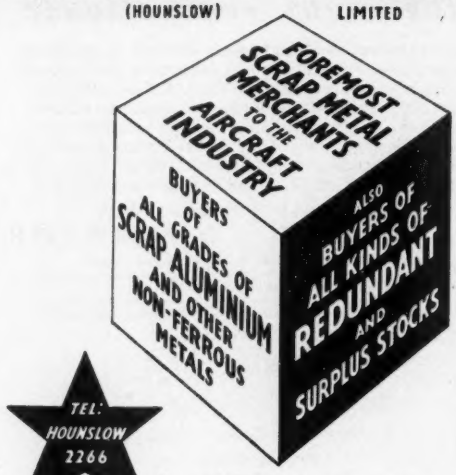
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SITUATIONS VACANT

DOWTY EQUIPMENT, Ltd., Aircraft Hydraulic Engineers, Arle Court, Cheltenham, require design draughtsmen, preferably with some knowledge of hydraulic and landing gear components for aircraft. Write: Personnel Manager, giving details of training and experience, and mentioning age and salary range. [6902]

THE DE HAVILLAND AIRCRAFT Co., Ltd., have vacancies for senior design and intermediate draughtsmen (preferably with aircraft experience) in their Hatfield and London (Regent Street) offices.—Applications, stating age, experience and salary required, to Chief Draughtsman, The de Havilland Aircraft Co., Ltd., Hatfield, Herts. [6571]

MAN with initiative and experience required to work on modern aircraft electrical test installations. Applicants should hold H.N.C. and have had drawing office experience. Write, giving age, experience, salary, etc., to the Personnel Officer, Saunders-Roe, Ltd., East Cowes, I.o.W. [6432]

THE Saunders-Roe weight group has vacancies for experienced junior weight engineers. Applicants with initiative and holding National Certificate should apply, stating age, experience, salary, etc., to the Personnel Officer, Saunders-Roe, Ltd., East Cowes, I.o.W. [6430]

JIG and tool draughtsmen required with experience either on airframe work, plant layout, machine shop production methods, or plastic moulding and hydraulic applications. Apply, stating age, experience and salary required, to Personnel Manager, Folland Aircraft, Ltd., Hamble, Southampton. [6426]

SENIOR test engineer required, age 25-35. Higher National Certificate and previous experience in aircraft hydraulics essential.—Write, stating age, experience and salary required, to Mr. R. T. Sewell, Chief Test Engineer, British Messier, Ltd., Cheltenham Rd. East, Gloucester. [6449]

AIR ENTERPRISES, Ltd., Renfrew Airport, Glasgow, urgently require captains and radio officers. Agreed rates of pay and conditions of employment plus flying bonus. Minimum qualifications: commercial pilots' licence and instrument rating, R/T licence, radio officer's 1st class licence. [6389]

VACANCIES exist on the staff of a well-known instrument manufacturer for assistant engineers to carry out experimental and development work on aircraft instruments in their laboratory in Gloucestershire. Candidates should be qualified electrical and/or mechanical engineers and should have a sound knowledge of drawing office practice and design.

PREFERENCE will be given to those who have had previous laboratory experience and who are already conversant with aircraft requirements. Previous experience in one of the following fields will be an advantage.

DESIGN and development of:

(a) D.C. and a.c. "selsyn" remote indicating and synchro-control elements.

(b) Electrical tachometry.

(c) Electronic circuit design.

(d) Gyroscopic equipment.

(e) Moving coil instruments.

(f) Pressure sensitive instruments.

(g) Metallurgy and metallography.

THE salary range will be £400-£600 per annum, according to qualifications and experience.

ASSISTANCE in housing accommodation may be given at a later date as opportunities permit.

APPLY immediately, Box 1901, giving details and qualifications and experience. [6435]

A VACANCY exists in the experimental department at A Saunders-Roe, Ltd., for a good technician with experience in mechanical and structural testing. Applicants, who should have the H.N.C. or equivalent qualification, should write, stating age, salary, experience, etc., to the Personnel Officer, Saunders-Roe, Ltd., East Cowes, I.o.W. [6431]

ENGLISH ELECTRIC at Warton invite applications from draughtsmen with bomb installation and armament experience. These positions are permanent and pensionable. Applicants should write, giving full details and mentioning Ref. 120E, to Central Personnel Services, English Electric Co., Ltd., 24-30, Gillingham St., Victoria, London, S.W.1. [6445]

AIR FORCE, Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd. Applications are invited from senior and junior draughtsmen, and stressmen, for work on this interesting programme. Write, giving details of experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Luton, Beds. [6596]

ENGLISH ELECTRIC invite applications from all grades of draughtsmen to work on an interesting new project in the Acton, London, aircraft drawing office. These positions are permanent and pensionable.—Those wishing to apply should write, quoting Ref. 140B, to Central Personnel Services, English Electric Co., Ltd., 24-30, Gillingham St., London, S.W.1. [6466]

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows. Designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [6130]

APPLICATIONS are invited from senior and intermediate design draughtsmen; experience of aero engine design desirable but not essential. Please write, stating age and giving details of previous experience in chronological order, to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [6467]

BRITISH EUROPEAN AIRWAYS have vacancies for aircraft radio officers possessing current statutory first-class licence with recent aircraft experience. Commencing salary between £550-£700 p.a., according to qualifications and experience, plus London allowance when based in London area. Requests for application form to Personnel Officer, Flight Operations Dept., B.E.A., Ruislip, Middlesex. [6453]

APPLICATIONS are invited from engineers with mathematical ability to fill vacancies in the hydrodynamics department for the assessment of hydrodynamic performance of seaplanes and other marine craft. Staff assurance scheme and pleasant working conditions.—Write, giving full details of age, experience, and salary expected, to Personnel Officer, Saunders-Roe, Ltd., East Cowes, I.o.W. [6344]

DEVELOPMENT engineer required for work in connection with aircraft pressurizing and air conditioning. Theoretical and practical experience of compressors, ducting and air flow calculations essential. Vacancy offers excellent prospects and experience for keen man.—Write, stating age, experience and salary required, to the Personnel Officer, Sir George Godfrey and Partners, Ltd., Hampton Road, Hanworth, Middlesex. [6460]

DEVELOPMENT engineers and senior draughtsmen required with experience in light hydraulic controls and/or fuel metering; also detailing draughtsmen for this type of work. The factory is situated in the grounds of a country house and the wages and conditions are excellent. Hostel available.—Write: Personnel Manager, Dowty Equipment, Ltd., Arle Court, Cheltenham. [6803]

HANDLEY PAGE, Ltd., have vacancies for a technical assistant with a good mechanical engineering background, who will be required to carry out work in connection with thermo-dynamic problems for aircraft air conditioning and de-icing systems. Write, stating age and giving particulars of qualifications and experience, to Staff Officer, Handley Page, Ltd., Claremont Rd., London, N.W.9. [6458]

A HOUSE (married accommodation) is available for an experienced electronics engineer capable of developing anti-vibration mounts for electronic equipment. Location is special laboratory within 50 miles of London. Starting salary £300-£500 per annum, according to qualifications. Send details of qualifications and experience, mentioning Ref. 850B, to Central Personnel Services, English Electric Co., Ltd., 24-30, Gillingham St., London, S.W.1. [6451]

AUTO setters required, experienced B.S.A. and B. and S. or Swiss type machines. Consideration will be given to the training of capstan setters. Applicants must be fully skilled in working to close limits and willing to work alternate fortnightly shifts. Good conditions. Top rates plus piecework bonus. Apply, in writing, to Aviation Developments, Ltd., Woodfield Rd., Welwyn Garden City, Herts. Interviews granted at applicant's convenience. [6448]

BRITISH EUROPEAN AIRWAYS have vacancies at Northolt for Link Trainer instructors with R.A.F. category "A" qualifications. Applicants preferred with up to date knowledge and experience of instrument approach procedures including airways system. Commencing salary £525 per annum. Pension, insurance and sick pay schemes; air travel concessions. Applications to Personnel Officer, Flight Operations Dept., B.E.A., Ruislip, Middlesex. [6469]

AIRTECH Ltd., Aylesbury and Thame Airport, Haddenham, Bucks. Require large numbers of skilled detail fitters and semi-skilled operators for aircraft manufacture, also aircraft fitter/riggers for installation work. Previous manufacturing experience preferred but not essential. Excellent long term prospects and pay with opportunities for good bonus earnings. Apply, in writing, to Personnel Superintendent or telephone Aylesbury 1163. [6466]

R.A.F. tradesmen. An excellent opportunity awaits you at Airtech Ltd., Aylesbury and Thame Airport, Haddenham, Bucks. Vacancies exist for skilled fitter/riggers, radar/radio mechanics and electricians on aircraft and component work of great national importance. Excellent pay and prospects with opportunities for considerable bonus earnings. Hostel accommodation for single men. Apply to Personnel Superintendent at above address or telephone Aylesbury 1163. [6465]

DRAUGHTSMEN, mechanical, required for the Weybridge area, with National Certificate or equivalent instrument and light mechanism experience essential, working knowledge of camera optics and operating mechanisms. Capable of developing designs to their conclusion into complete production drawings. Excellent working conditions, rates of pay, canteen facilities and five-day week.—Particulars of age and experience and salary required to Box 1586. [6377]

WILLIAM DEMPSTER, Ltd., require first-class licensed flight radio officers for permanent employment on aircraft operating on overseas services. Commencing salary £600 p.a., plus allowances for flight navigator's licence or practical navigation experience. Also first officers required to be trained as captains on four-engined aircraft. A.T.P.L. essential. Allowances for flight navigator's licence, R.A.I.-F.A. rates.—Apply: 65, New Cavendish St., London, W.1, or phone Langham 4721 for interview. [6440]

HANDLEY PAGE (READING), Ltd., have vacancies in their design office for senior and junior draughtsmen with aircraft experience. Also required are stressmen, who should have at least two years' experience and with a degree or Higher National Certificate with endorsements in aeronautical subjects. These positions are progressive and offer excellent opportunities to the right men.—Please send full particulars to the Personnel Office, Handley Page (Reading), Ltd., The Aerodrome, Woodley, Reading. [6901]

BRITISH OVERSEAS AIRWAYS CORPORATION offer opportunities of work on modern airliners to the following tradesmen: electricians, instrument mechanics and radio mechanics, sheet metal workers, engine and airframe fitters experienced in the maintenance or overhaul of aircraft and/or components. Rates of pay, 2/10 per hour, plus 4½d. per hour provisional bonus. Attracting proficiency pay up to 3d. per hour; five-day, 44-hour week possible shift work. Good pension, sick pay and holiday facilities.—Write or call: Staff Manager, Hut 20, London Airport, Feltham, Middlesex. [6600]

SERVICE engineers required in West London area. Must be technically qualified and fully conversant with the aircraft industry, capable of dealing with technical and maintenance problems relating to positive displacement pumps and high-speed precision engineering. A knowledge of a.c. and d.c. aircraft electrical systems would prove advantageous. Possession of a car is an essential requirement to this post.—Write, stating salary, age, qualifications and experience, to the Personnel Officer, Sir George Godfrey and Partners, Ltd., Hampton Rd., Hanworth, Middlesex. [6461]

LEADING manufacturer of aircraft instruments and electronic equipment invites applications for a vacancy in the areonautical service department. Duties will include installation, flight testing and servicing, for which a thorough practical and theoretical knowledge of a.c. and d.c. amplifier systems is required. A knowledge of electro-mechanical servo and synchronous transmission systems would be of advantage. Preferential consideration would be given to applicants with previous electronic experience in possession of Higher National Certificate (or equivalent), or who have served a recognised engineering apprenticeship with subsequent experience in a technical capacity. Must be prepared to travel. Position will be permanent and pensionable after a qualifying period. Commencing salary £450 p.a. Apply giving full particulars of age, qualifications and experience, to Box No. A.C. 63168, Samson Clarks, 57-61, Mortimer Street, London, W.1. [6468]

SITUATIONS WANTED

DESIGNER-DRAUGHTSMAN requires post; 20 years' experience structures and engine installation. Initiative rewarded. Box 1897. [6415]

COMMERCIAL pilot, 800 hours light aircraft, licensed ground engineer, 10 years' experience, several hundred hours in rural aviation, desires position. Preferably Instructor("C" rating held)-engineer. Single. Arriving England July from Australia. Box 1902. [6443]

WANTED

STEEL, aluminium, brass. Sheets, strip, bars, off-cuts. Any quantity. Immediate payment.

GRADES SHEARED METAL Co., Ltd., Green Lane, Hounslow, Middx. Tel. Feltham 3274. [5356]

DEATHS

ON Saturday, May 19th, after an operation, Wing-Commander RHYS THOMAS, D.S.O., D.F.C., husband of Lilian, Marlyns, Birdham Road, Chichester. [6438]

GROUND POWER UNITS

Volts	Amp.	Engine
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28.5	175	Waukesha Petrol
28.5	265	Waukesha Petrol
28.5	600	Continental

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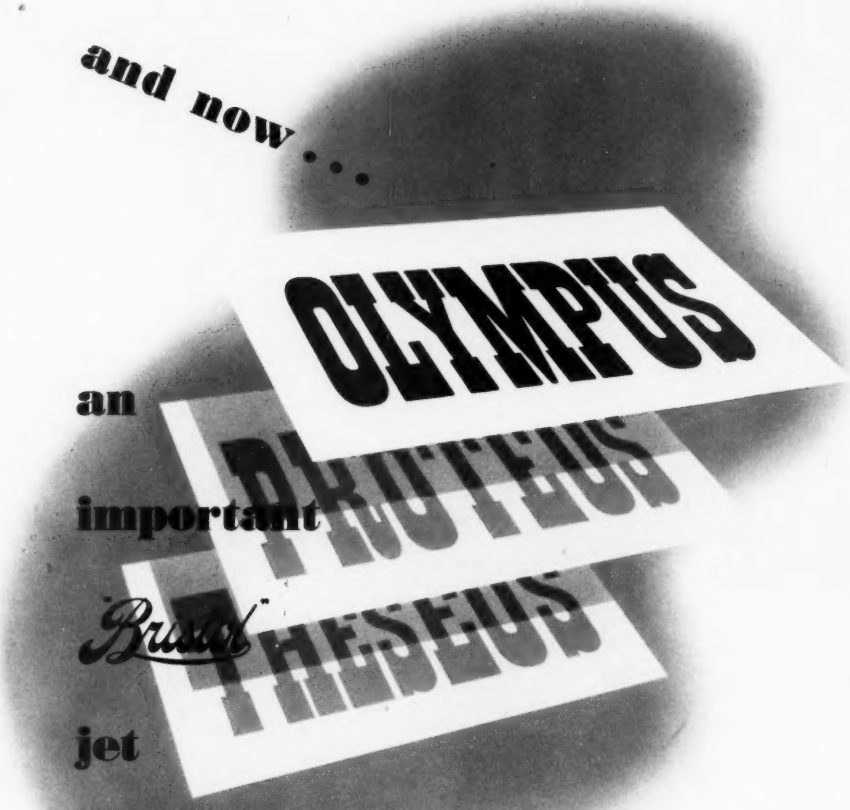

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